Welding Engineer

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FEBRUARY, 1957

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New Neoprene rubber insulators, strongly built around steel sleeves, have tapered ends to stretch over the welding cable snugly. They lock out moisture, oil and dirt, don't catch against obstructions.

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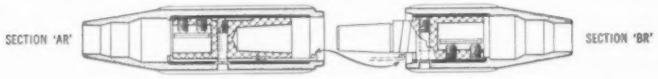
Model 2/0-R, as illustrated, takes cables 1/0 and 2/0, mechanical, soldered or brazed connection.

Model 4/0-R takes cables 3/0 and 4/0, soldered or brazed connection only.

Section BR (male) of model 2/0-R can be used with section AR (female) of model 4/0-R where the use of different sizes of cables may be desired.



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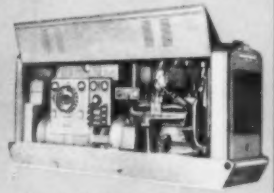

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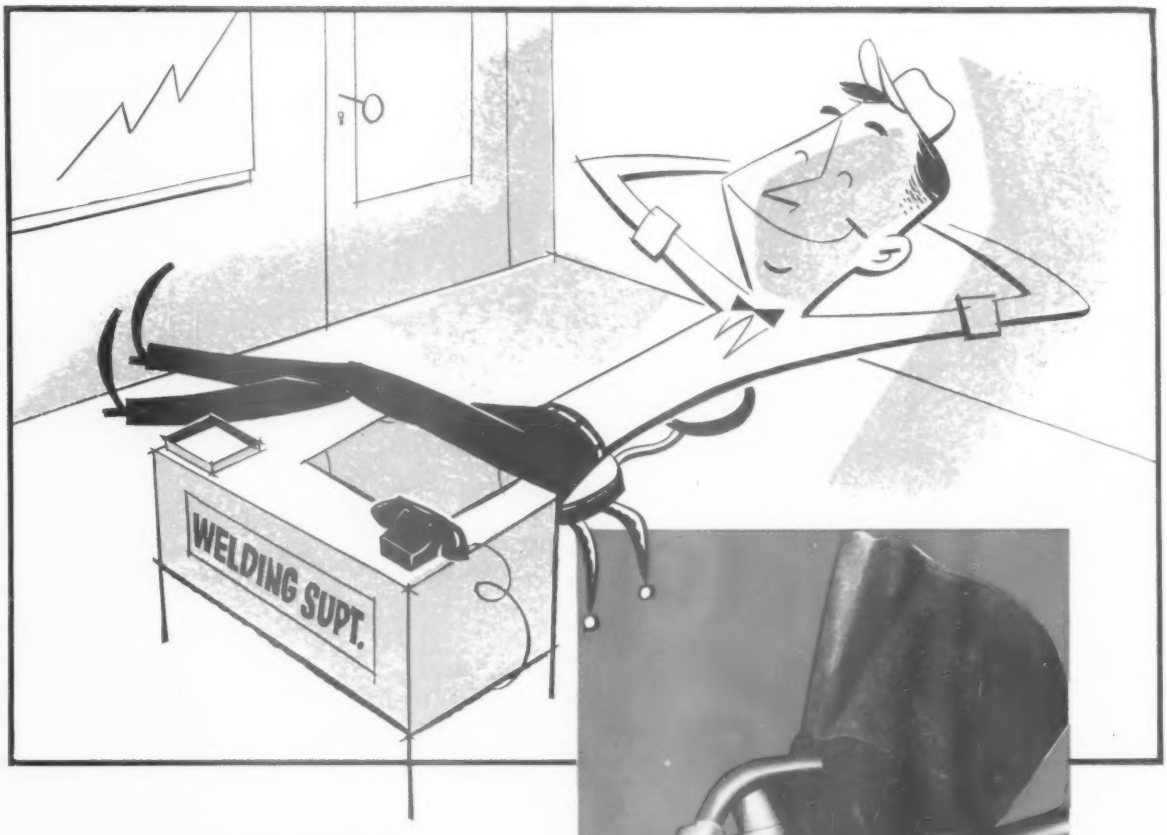

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Welding Engineer

FEBRUARY, 1957
VOL. 42—No. 2

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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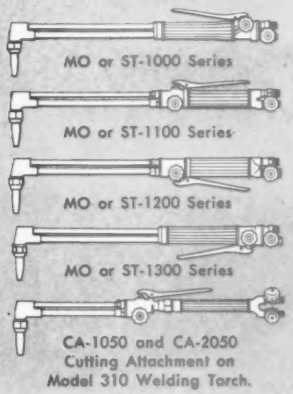

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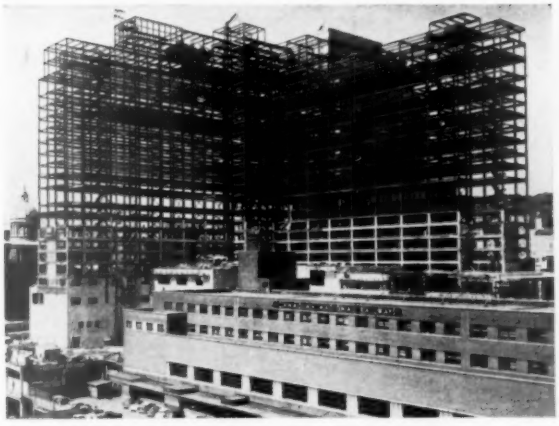


QUEEN Elizabeth Hotel rises on Place Ville-Marie in the city of Montreal. The 21-story hotel will open in 1958. (See story below.)

—*The Lincoln Electric Co.*

FRANCISCAN missionary, Father Brice Schiltgen, gives welding instructions to native Brazilians. (See story below.)

News

Montreal hotel is welded

The new Queen Elizabeth Hotel takes shape on the Place Ville-Marie in Montreal, Canada. The 21-story structure, to be opened in 1958, will contain more than 1,200 guest rooms. The public rooms will be capable of accommodating 2,500 persons at banquets and more than 4,000 at meetings. In addition, a 20,000 gal reserve water supply will be stored in tanks on the 21st floor. Shop and field fabrication of the hotel was accomplished by welding. The structure is being built by Canadian National Railways.

Inco plans nickel facility in Manitoba

Plans for development over the next three to four years of a $175,000,000 nickel project in the Mystery-Moak Lakes area in Northern Manitoba, Canada, are under way by the government of Manitoba and The International Nickel Co. of Canada, Ltd.

Inco will open two new nickel mines in the area to be known as the Thompson and the Moak mines. By arrangement with the Manitoban government, the new town and plant site as well as immediately adjacent mine will be named Thompson in honor of Dr. John F. Thompson, Inco chairman of the board.

The project in Manitoba together with the facility in the Sudbury district of Ontario, will lift Inco's nickel-producing capacity by approximately 130,000,000 lb to 385,000,000 lb. The Manitoban government will construct a power plant at Grand Rapid on the Nelson River to supply power.

U.S. Rubber wire, cable to Kaiser

Kaiser Aluminum & Chemical Corp., Oakland, Calif., has purchased the wire and cable operation of United States Rubber Co. The transfer, which became effective February 1, includes U. S. Rubber's insulated wire and cable plant at Bristol, R. I., and its wire and cable inventories. The corporation plans to continue service with no change in personnel. Kaiser plans, however, to add insulated conductors in both aluminum and copper.

Vitro forms manganese firm

Vitro Corp. of America, New York City, has formed a new firm to produce manganese from domestic ores. Associated in operation of the new firm, U. S. Manganese Corp., are Sheer-Korman Associates, Inc., and Great Divide Mining & Mfg. Corp. Sheer-Korman has supplied processes and patents for production. Great Divide will supply rhodonite ore.

Missionary brings welding to Brazil

Father Brice Schiltgen, a Franciscan missionary, has brought welding to his mission outpost in Brazil. Fabrication and repair by welding are particularly valuable to him as the nearest shop is 200 miles by river boat. Power is supplied by a diesel generating plant. It also operates the deep freeze which preserves his food supply. Part of this supply is monkey meat when no other is available. Father Schiltgen received welding instruction at St. Paul Structural Steel Co., St. Paul, before returning to the Amazon jungles.

Carborundum plans new abrasive plant

The Carborundum Co., Niagara Falls, N. Y., plans to build a multimillion dollar plant in Van Wert, Ohio, for manufacture of small abrasive wheels.

The single ground floor structure will be 440 by 160 ft, with side extensions for kilns and another for offices. It will provide 91,000 sq ft of floor space. Scheduled for completion late this year, with operation by late 1958, the new plant is part of Carborundum's current $30,000,000 modernization and expansion program. Another plant is under construction at Parkersburg, W. Va., for zirconium production.

Crucible Steel to expand

Crucible Steel Co. of America, Pittsburgh, has announced plans for an additional $25,000,000 new facilities expansion. A capital program of $20,000,000 is currently underway.

—Linde Air Products Co.

TIG torch moves along track beam above aluminum tube, completing longitudinal weld. Pre-rolled tube, supported on cradle, is clamped between copper bars. (See story below.)

SECTION of condenser test tube sheet with Tig welded tubes. To prevent distortion, circular pits are cut in sheet around each tube hole leaving collar around hole, about as thick as tube itself. This reduces current needed and heat generated. (See story below.)

Tig welding aluminum covers

High-speed mechanized Tig (tungsten inert-gas) welding has produced uniform warp-free welds in fabrication of aluminum covers for high-tension bus bars at Chicago plant of Delta-Star Electric Division, H. K. Porter Co.

Rapid welding rate, 24-36 ipm, minimizes warpage in aluminum tube cover. Dust-tight covers are fabricated from pre-rolled aluminum tubes, 19-36 in. diameter and up to 8 ft. long. Cover is welded by fusing aluminum along longitudinal joint. The bus bars are used between generators and transformers of power stations.

Whitehead plans Connecticut facility

Cornerstone for a new 35,000 sq ft office and warehouse was laid recently for Whitehead Metal Products Co., Inc., at Windsor, Conn. Participating were Governor Abraham Ribicoff of Connecticut and T. M. Bohen, board chairman of Whitehead Metal. The building will be one-story, of brick and aluminum, and is planned for completion by June.

Sylvania, Corning form atomic firm

Sylvania Electric Products Inc. and Corning Glass Works, Corning, N. Y., will form a jointly-owned company for the purpose of research, development and production in the atomic energy field.

Sylvania has taken option on a 150-acre site in Andover, Mass., as the proposed location for a new multi-million-dollar atomic center. The option was taken pending formation, in the near future, of Sylvania-Corning Nuclear Corp. Operation of the new facility is planned for early 1958. The center would comprise five modern buildings, totaling 150,000 sq ft.

Chase Brass in L. I. building

After 42 years at 80 Lafayette St., New York City, Chase Brass & Copper Co. recently moved into its own new building at 55-60 58th St., Maspeth, Long Island. The move includes office and warehouse.

Thermacote Co. moves facility

Plant and general offices of Thermacote Co. have been moved to 108 S. DeLacey Ave., Pasadena, Calif. Formerly a subsidiary of Holiday Plastics, Inc., Kansas City, Kans., Thermacote was recently purchased by Robert Vaillancourt. Two new branch offices have been opened: 430 S. 6th St., Brooklyn, and Atglen, Pa., a Philadelphia suburb.

M&T to build Kentucky chemical plant

Metal & Thermit Corp., New York City, will begin construction soon of a new chemical processing plant on a 163-acre site near Carrollton, Ky. The initial development will cover ten acres and include an office building, warehouse and steam plant as well as production buildings.

The plant will produce organic chemicals for plastics, textile, pharmaceutical and other industries. Also to be manufactured will be organic tin chemicals for a wide variety of chemical and plastic products.

Tube condenser is Tig welded

A Tig (tungsten inert-gas) welded tube condenser, a 90,000-sq ft single-pass unit, will be supplied a midwestern utility by Allis-Chalmers Mfg. Co. The condenser will be tubed on the job with an automatic Tig welding device designed by Allis-Chalmers.

The automatic device was developed as a result of experimental work on welding of condenser tubes to tube sheet to meet a trend toward higher pressures, once-through boilers and nuclear plants requiring positively pure water. Allis-Chalmers conducted many tests with some 100 different combinations of tubes and tube sheet alloys over a period of years.

GE opens new carbide facility

A new eastern carbide metals shop geared to process small quantities of especially-shaped cemented carbide tools has been established by General Electric's Metallurgical Products Department, Detroit.

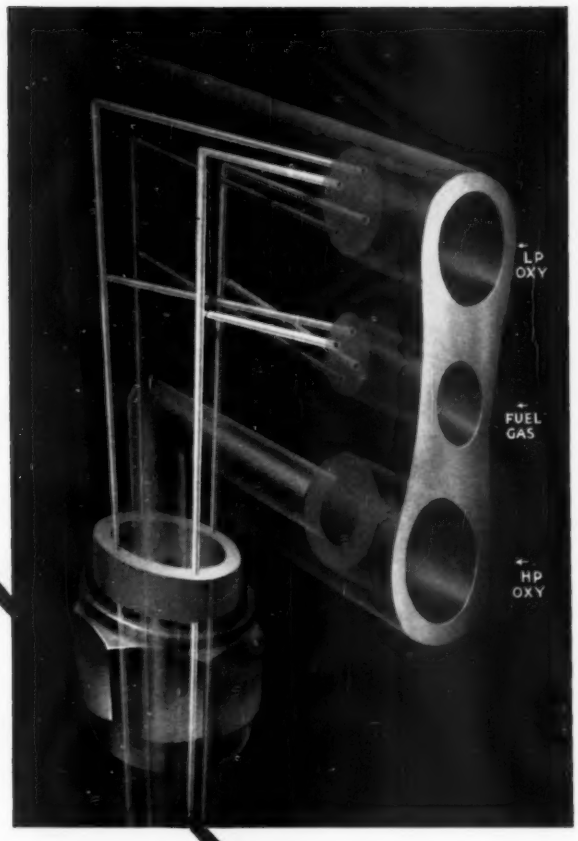
The new facility, located in Kenilworth, N. J., covers 5,000 sq ft. It will service the eastern half of the country. Complicated shapes and blanks requiring inside forming will be handled from Detroit.

Announce program for AWS spring meeting

Where and how welding is used in fabrication of nuclear power plants will be the subject of two technical sessions at the National Spring Meeting of the American Welding Society. The meeting will be held in conjunc-

(Continued on page 96)

this finer cutting torch



multiple mixer in torch head... it offers greater safety and greater efficiency...

A cutting torch mixer may be located either within the torch handle, the torch tubes or the torch head. When located within the handle or the tube, the mixer is situated in close proximity to the operator's hands; no torch, however, need be held by its head.

And, besides, there is plenty of metal in that torch head to permit for an added advantage: Multiple Mixing. By breaking up the streams of the low pressure oxygen as well as the fuel gas into several separate channels, the port diameters are lessened, thus offering greater flash-back resistance.

This modern, patented, Multiple Mixing in the torch head is costlier to manufacture but it eliminates the need for a separate mixer, leaky seats and joints, and years of experience in shop and field have proved the outstanding excellence of this patented design feature.

the mixer is located where it works best...and is safe.

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Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Monastic welding

Dear Sir:

When the Between Passes drawing from the December issue, p. 17, was placed upon our bulletin board the general consensus of monastic opinion seemed to be that it is a rather good likeness of myself. Be that as it may, you can bet your own bottom dollar we are also of the opinion that we find many of the articles in WELDING ENGINEER of helpful interest in the repair and maintenance welding around the monastery.

We have a fairly large agricultural operation here at St. Joseph's Abbey. Since welding is a must for any efficient farm, we have five brothers who can weld with our 400 amp d-c welder. Two of these brothers can also weld with our oxyacetylene outfit. At present, we are searching the area for a used portable welder which will enable us to increase our efficiency by making on-the-spot repairs.

Brother Placid O.C.S.O.
Spencer, Mass.

Pioneer forward

Dear Sir:

I want to congratulate you on the great strides forward that have been made by your pioneer magazine. I am very glad to be a subscriber. My comments, welcome or not, follow:

Your wonderful issue last May was a standout, a masterpiece for welding advancement. The October, 1956, issue (World of Welding) certainly fills the need to aquaint Americans with great progress of welding abroad. May it wake us up! The December, 1956 editorial "Where are today's pioneers?" impressed me very much. The recent November editorial regarding a full day's production for a day's pay is excellent. All the editorials have been opportune and interesting.

Regarding the reason structural welding in large structures has lagged here

while progress is made by other countries, may I suggest WELDING ENGINEER put out color, sound films. These films could be borrowed or rented. Only by adequate, direct, interesting visual presentations can engineers be awakened to use of welding.

Robert S. Hale
Chicago, Ill.

Filler metals

Dear Sir:

My attention was drawn to the fine article on "Filler metals for joining" in the December, 1956, issue, p. 54. I think the data in Table II, p. 56, does not take into account stub-end losses. A check I have made on the number of feet of 1/4-in. fillet welds which can be made with an E6012, includes both deposition efficiency factor and stub-end loss. It shows 535 ft per 100 lb of 1/4-in. horizontal fillet, with a 3/16-in. diameter 6012 under production conditions (i.e., allowance for seepage when fit-up was not perfect and profile was not exactly flat. Stub-end loss allowance was 17%). *(This compares to a projected 728 ft per 100 lb in the table. —Ed.)*

The article is timely and excellent in every respect. We have pointed out to our sales representatives that customers rejecting powdered-metal electrodes on the basis of price are, in many cases, pennywise and pound foolish.

H. O. Westendarp
General Electric Co.

—Author Orville Barnett has referred reader Westendarp to Ernest Di Liberti of Air Reduction Sales Co., whose article in the August, 1956, issue of The Welding Journal *(Fig. 3, p. 793) cited the figures reproduced in the table in question. For further comment on this December article, see p. 38.*

Stratosphere pioneer

Dear Sir:

In the June, 1933, issue of WELDING ENGINEER, an article on stratosphere flight appeared by Dr. Jean Piccard. On page 30 there are two illustrations showing the construction of the cabin of the stratosphere balloon which was used by us in our stratosphere flight in 1934. I would like very much to have copies of these pictures.

Dr. Jeannette Piccard
Minneapolis, Minn.

—Glossy prints of negatives as far back as June, 1933, unfortunately, are not available. Back in those days WELDING ENGINEER was under different management and files are incomplete.

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You get an overlay with remarkably long life in severe metal-to-metal wear applications, when you use Ampco-Trode electrodes. They are available in a wide range of deposit hardnesses resistant to all forms of wear — sliding wear, erosion, cavitation-pitting, and corrosion.

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Add extra life to bearings, bushings, sheaves, gears, pinions and many other parts. Stock all five grades of Ampco-Trode electrodes and have a variety of deposit hardnesses on hand.

Write for Bulletin W-17.

Ampco-Trode Grades	Electrodes & Filler Rod	Deposit Hardness Metallic-Carbon-Arc	Deposit Hardness Inert-Gas
	Ampco-Trode 10	130-150	160-190
	Ampco-Trode 160	150-170	190-220
	Ampco-Trode 200	180-220	250-280
	Ampco-Trode 250	230-270	310-340
	Ampco-Trode 300	280-310	350-380

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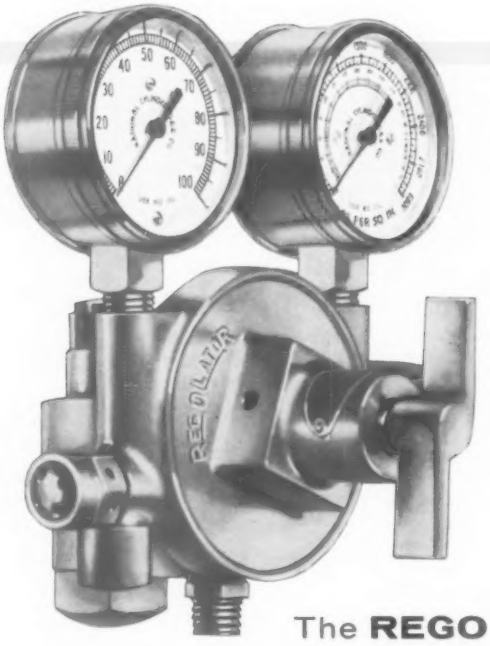

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for stable, unvarying gas pressures

Two-stage construction. Balanced design using opposing valve characteristics maintains preset gas pressures unvaryingly through all stages of usable pressure. No more varying flames; no more running back and forth to make corrective adjustments. You set it and forget it.

Cartridge type sintered metal filter serves double purpose: keeps out destructive dust and dirt, lasts longer; prevents seat ignition by radiating recompression heat to valve body. Diaphragm mounting and bonnet have safety vents. Automatic relief valve protects from excessive pressure in first stage cavity. Forged bronze construction assures long life.

Models for standard duty, heavy duty and manifold service. Also single stage regulators.

NCG®

NATIONAL CYLINDER GAS COMPANY

840 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

Branches and Dealers from Coast to Coast

**Registered trademark of The Bastian-Blessing Co.*

REGO GX Welding Torch

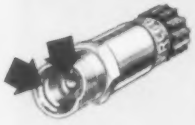
for ALL welding . . . from lightest sheet to heaviest casting

Superior design and painstaking manufacture account for the superlative performance and long life of the Rego GX. Precision adjustments, easily made, unvaryingly held, provide maximum flame efficiency. Free-flow mixer has proportioned and machined gas passages for perfect mixtures. Unique mixer design brings acetylene in through center, snuffs out fire in event of backfire or flashback. Mirror-burnished tip passages eliminate turbulence.

Fatigue factor minimized by tremendous weight-reduction. Handle and body made of lightweight yet strong aluminum alloy. So light and so perfectly balanced operators everywhere prefer the GX torch for this reason alone.

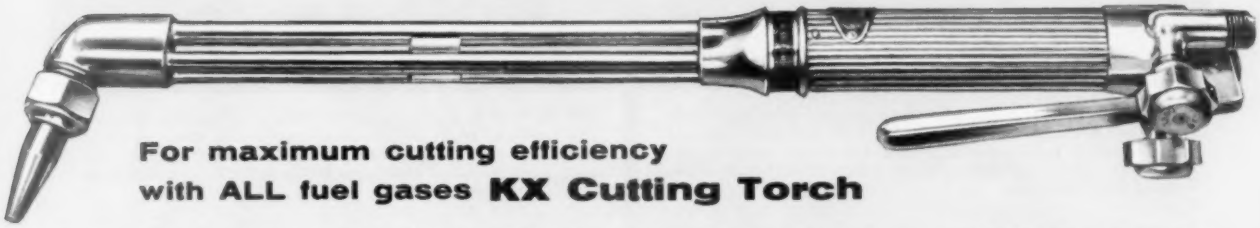
GX handles lightest sheet up to heavy castings. Operates at low pressures producing soft flames. Cylinder residuals reduced to a minimum. With KXA Cutting Attachment will cut steel up to 8" thick.

Leak-proof Joints . . . with Hand Tightening



Neoprene seating rings in the torch head permit positive, leak-proof coupling of mixer and handle with hand tightening alone. Result is longer torch life. No metal-to-metal contact. No strain on threads. Seating rings absorb normal wear and abuse, prevent scratching or scoring of metal seating surfaces.

Big, easy-grip valve wheels permit precision setting. Chrome-plated valve seats, monel valve stems. Non-seizing, non-scoring.



For maximum cutting efficiency with ALL fuel gases KX Cutting Torch

For toughest heavy-duty cutting of plate, multiple plate, slabs, sheets, and scrap. Ideal for use in shops, industrial plants, scrap yards, railroads—*wherever maximum cutting capacity is required.* Precision valve settings remain stable and uniform. Mixer delivers perfectly mixed gases. Perfectly proportioned and swaged tip passages provide non-turbulent preheat flames. Tip-mix type KX Cutting Tips—for cutting lightest sheet metal to heaviest sections—are available for use with any fuel gas.

Diaphragm type high pressure valve in forged brass body replaces conventional packing to prevent leaks. Long high pressure lever gives operator precise control of cutting oxygen.

Stainless steel tubes in triangular construction give maximum strength and rigidity. Tubes silver-brazed at head and valve body to provide strong leakproof joints.

Stainless steel head withstands high heat without distorting, eliminates gas leaks that result from warped seating surfaces.

NCG 44 Bantam® Welding Torch

for LIGHT welding

The one light welding torch with all the features welders look for. Welds aluminum and alloys, aircraft tubing and steel from 28 gauge to ⅜" thick. It's light, easy handling, compact—*gets into an absolute minimum of space.* Valve wheels are right under your thumb for quick adjustment. Stainless steel stems are non-seizing and non-scoring. Nickel alloy tubes are silver brazed for added strength. Uses swaged-style Series NCG-71 Tips or screw-in style Series NCG-170 Tips. Length, less tip—6½".

Copyright 1957, National Cylinder Gas Company

THE BFR WHEEL is outstanding for light weld grinding, blending contours and corners, removing rust and scale, scarfing and beveling before welding. This soft-action, semi-flexible hub-type wheel has cotton fabric reinforcement with additional layer of Nylon.

THE BD WHEEL is ideal for heavier weld grinding jobs, smoothing flame-cut edges and stainless steel welds, many slotting, notching and cutting-off operations and removing light fins from castings. Glass cloth plus Nylon is the reinforcement in this rigid hub-type wheel.

LIGHT or HEAVY

Norton Reinforced Wheels bring the money-saving "TOUCH of GOLD" to countless weld grinding jobs

Two of the most popular Norton reinforced hub-type wheels — the semi-flexible BFR for light duty and the rigid BD for heavier work — make a team that can't be beaten for all-around usefulness. Separately, each handles a considerable number of grinding jobs. Together, they cover an almost endless list of applications, ranging from lightest scale removal to finishing heavy stainless steel welds. And they do every job with the extra safety, service life and economy that adds the profit-building "Touch of Gold" to your grinding operations.

Where regular type abrasive wheels are called for, remember that the Norton line is 100% complete, with shapes and sizes for every application. In particular, B-11 resinoid bonded wheels for your heavier jobs have the uniformity of structure and perfect balance that results in easier, faster, more profitable grinding.

See Your Norton Distributor or write the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1710

NORTON
ABRASIVES
Making better products... to make your products better

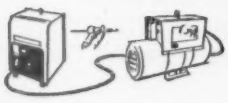
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cat Tapes

FEBRUARY
1957

Your *Weld World* at press time

Last minute news of interest to those engaged in joining and severing materials.



..Welding will play an important role in a proposed atom-powered oil tanker submarine. The revolutionary craft is to be built in Japan by Mitsubishi industries. Expected to weigh 30,000 tons and cruise at 22 knots (submerged), the sub-tanker will be 540 ft long and 69 ft wide. (The Nautilus is only 300 ft long and 28 ft wide.)

..Linde's new welding process "Unionarc" was unveiled Jan. 22. The process makes use of a bare wire electrode which is coated with magnetic flux as it is fed through the nozzle. In addition, Linde has added this refinement: use of carbon dioxide as a shielding gas. For more on this new process, see the March issue of Welding Engineer.

..Resistance Welding Alloy Association expects good year in 1957. Sales in last quarter of 1956 were running higher than customary, and are expected to hold up well into early months of this year. RWAA is now developing new and revised electrode standards.

..Newest fashion in weldor's head-dress is the tinted helmet. One manufacturer has them available in blue, green and red as well as the standard grey.

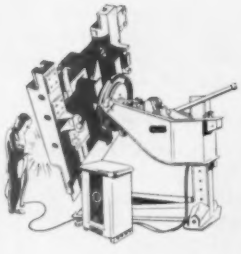
..Stockholders in American firms received $11.5 billion in dividends during 1956—a new record. This was $300,000,000 better than in 1955. Among the top 12 disbursers were General Electric, U. S. Steel and Kennecott Copper. General Motors topped the list.

..Steelmaking capacity set new record during 1956 when it rose to 133,459,150 tons annually as of Jan. 1. This marks 10th straight year that capacity has been increased. Outlook for 1957 production is rosy...1956 would have been record year were it not for five-week strike in summer.

..Ultrasonics will make greater strides this year than ever before. Recent symposium told of three-fold expansion during 1957. In welding field, ultrasonics are used for non-destructive testing and fluxless soldering.

..Bernard Welding Equipment Co. should cause some excitement in the Mig welding field soon when they announce a newly-developed line for this process. The firm will provide everything but the power source. Another forthcoming Bernard development is a self-contained, recirculating cooling system for water-cooled Mig and Tig torches.

..New grinding wheel has just been introduced by Nu-Matic Grinders, Inc. Series of separate, replaceable rubber segments grip coated abrasive and form grinding surface. Advantages claimed: segments, as they become worn, can be replaced singly or in groups at low cost; segments of varying hardnesses can be used. For further details, see March Welding Engineer.



..American Institute of Steel Construction predicts new high in 1957 for structural steel fabrication. New orders may reach 4,050,000 tons—an increase of 4% over last year. One factor responsible for this outlook: a 16% increase in structural rolling capacity made by mills in 1956. Chief reason for higher demands: highway and bridge work under new road program.

..Six-year-old titanium industry expects to increase production of mill products more than 100% this year. In 1956, it made 10,600,000 lb of finished mill products; the 1957 goal is 23,000,000 lb. Further price reductions may be in offing.

BERNARD

"Shortstub"

ELECTRODE HOLDERS

NOW EQUIPPED WITH

CABLE SPLINT

ENDS CABLE FRAYING

"SHORTSTUB" equipped with "CABLE-SPLINT" completely and efficiently eliminates cable fraying. Minimizes cable waste, maintenance, and operator down time due to overheated holders.

"CABLE-SPLINT" is a standard feature on all "SHORTSTUB" holders at no additional cost.

Don't wait! Write for further information on this and many other exclusive features that make "SHORTSTUB" the recognized standard for modern high current, high speed welding.

PIONEER FOR BERNARD MODERN WELDING

WELDING EQUIPMENT CO.

10232 S. AVENUE N
CHICAGO 17, ILLINOIS

30 YEARS AGO

(Taken from *The Welding Engineer* of February, 1927)

The K-G Welding & Cutting Co. has announced plans to move to new and more spacious quarters at 513½-515 W. 29th St., New York City. The move from present quarters at 556 W. 34th St. provides two complete floors for plant and office.

— 30 YEARS AGO —

Mayer Lederer has joined the sales staff of Welding Service Co., New York City.

— 30 YEARS AGO —

H. H. Norton has taken charge of the welding department of Moore & Handley Hardware Co., Birmingham, Ala.

— 30 YEARS AGO —

David Bartlett, associated with Bastian-Blessing Co., Chicago, for the past three years, has formed a partnership with C. F. Weimer. The firm, to be known as Weimer Welding Supply Co., is located in Milwaukee.

— 30 YEARS AGO —

J. M. Cameron, formerly secretary of Gas Products Association, has resigned to accept a position with Imperial Brass Mfg. Co., Chicago.

— 30 YEARS AGO —

Craftsweld Equipment Corp., New York City, was formed recently by Charles Kandel. Located at 570 7th Ave., the firm will specialize in apparatus and engineering service for welding, cutting and industrial gases.

—30 YEARS AGO—

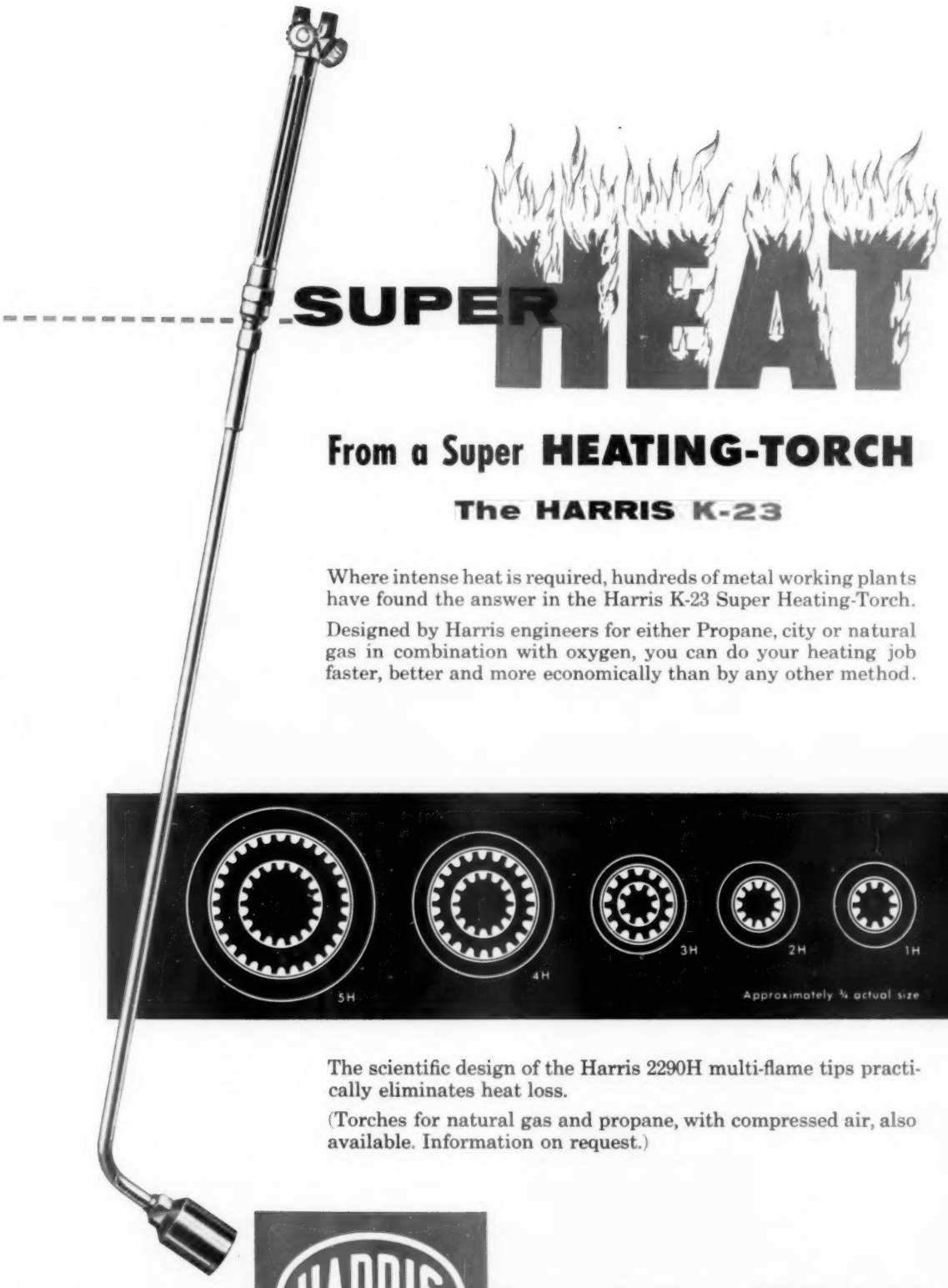
Indiana Oxygen Co., Indianapolis, so an article states, utilizes welding in creating its delivery truck signs. The letters of the signs, which appear to be painted, have actually been formed by cutting with an acetylene torch.

—30 YEARS AGO—

The X-ray room of the New Tampa Hospital, Davis Island, Tampa, Fla., was partially welded. Welding was used to close the seams of the lead wall lining and to seal nail heads in the walls.

—30 YEARS AGO—

The Canadian branch of the American Welding Society was formed recently after a group of 90 interested persons met at McGill University in Montreal.



SUPER HEAT

From a Super **HEATING-TORCH**

The HARRIS K-23

Where intense heat is required, hundreds of metal working plants have found the answer in the Harris K-23 Super Heating-Torch.

Designed by Harris engineers for either Propane, city or natural gas in combination with oxygen, you can do your heating job faster, better and more economically than by any other method.

The scientific design of the Harris 2290H multi-flame tips practically eliminates heat loss.

(Torches for natural gas and propane, with compressed air, also available. Information on request.)

HARRIS

HARRIS CALORIFIC CO.

5501 CASS AVE. • CLEVELAND 2, OHIO

STAINLESS STEEL WELDING WIRE...

Spooled... layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled... layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths... straightened and cut wire furnished in 36" lengths for inert arc and gas welding.

Sizes: .035", .045", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Two factors give

Drawalloy

CORPORATION

WELDING WIRE

best on-the-job performance

WEAR-O-MATIC HARD-FACING WIRE...

Coiled... precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

See your distributor or write Drawalloy Corporation, Lincoln Highway at Alloy Street, York 12, Pennsylvania

Drawalloy

CORPORATION

The Wire Mill For The Welding Industry

YORK, PENNSYLVANIA

Worthington positioner built for Combustion Engineering, Inc., Chattanooga, Tenn., handles loads up to 100,000 lbs.

Why are more weldments handled by Worthington than all other positioners combined?

Worthington power operated bench unit for positioning small work up to 100 lbs.

THE REASONS ARE MANY

One is good service. With distributors in all principal cities a Worthington positioning specialist is nearby to help solve your welding problems. Conservative ratings are another. Worthington engineers its positioners to deliver year after year the rating stamped on the nameplate.

Knowhow and experience complete the list. Conceived in the fabricating shop of Ransome Machine Co.—later to become an operating division of Worthington—positioners were pioneered by Worthington people for more than 25 years.

Let us help you "position for profit." For useful data on the Worthington line of positioners, automatic welding head manipulators, turning rolls, head and tailstocks, write to Section Y-72, Worthington Corporation, Harrison, N. J.

WORTHINGTON

LOOK FOR OUR DISPLAY IN BOOTH #207, WELDING SHOW, PHILADELPHIA, APRIL 9-11

At the McLendon Manufacturing Company . . .

Production increased 15% on engine mounts

"By switching to this General Electric welder we have all but eliminated downtime and have increased our production 15%. Our welding section is now 100% General Electric."—J. W. McLendon, President, McLendon Manufacturing Company.

"I'm sold on the machine. It has better arc striking quality than our previous m-g sets. Anyone can strike an arc with this welder. With the added arc force you get an instantaneous start of the weld."—W. E. McWilliams, weldor.

EXECUTIVE AND WELDOR AGREE IN SPECIFYING G-E WELDERS

Producing engine mounts that must withstand the vibration of 1500-horsepower, 3000-rpm engines, the McLendon Manufacturing Company demands welding equipment that gives them:

A STABLE ARC
STABILITY OF CURRENT
FLEXIBILITY OF CONTROL
ECONOMY OF OPERATION

With their General Electric 300-amp d-c rectifier welders they get all this . . . and more. J. W. McLendon, president of the Tulsa, Oklahoma firm, says, "After testing one of these units, I suggested we standardize on General Electric equipment. Now our welding section is 100% General Electric. By using the G-E welder and your W-616A and W-1016A electrodes we have a combination that gives cleaner, more uniform, and smoother welds."

Back in the plant, weldor W. E. McWilliams is pleased with Mr. McLendon's choice of equipment. "With our old welders," he says, "we had a lot of downtime for maintenance and repair. This always meant somebody was out of work for a while. Now, as Mr. McLendon says, with the General Electric equipment, we have reduced downtime practically to zero, and increased our production 15%."

The engine mounts welded by McLendon must be lightweight, yet strong enough to withstand the vibration from the powerful aircraft-type engines.

After the engine is placed on the mount, it is lifted onto a specially designed truck body. It is then used in oil producing areas as part of a mobile fracturing unit for increasing the flow of oil wells. To date there have been no structural failures on any of the great number of McLendon units in operation.

General Electric rectifier welders are designed to make the weldor's job easier while making surer strength welds at lower cost.

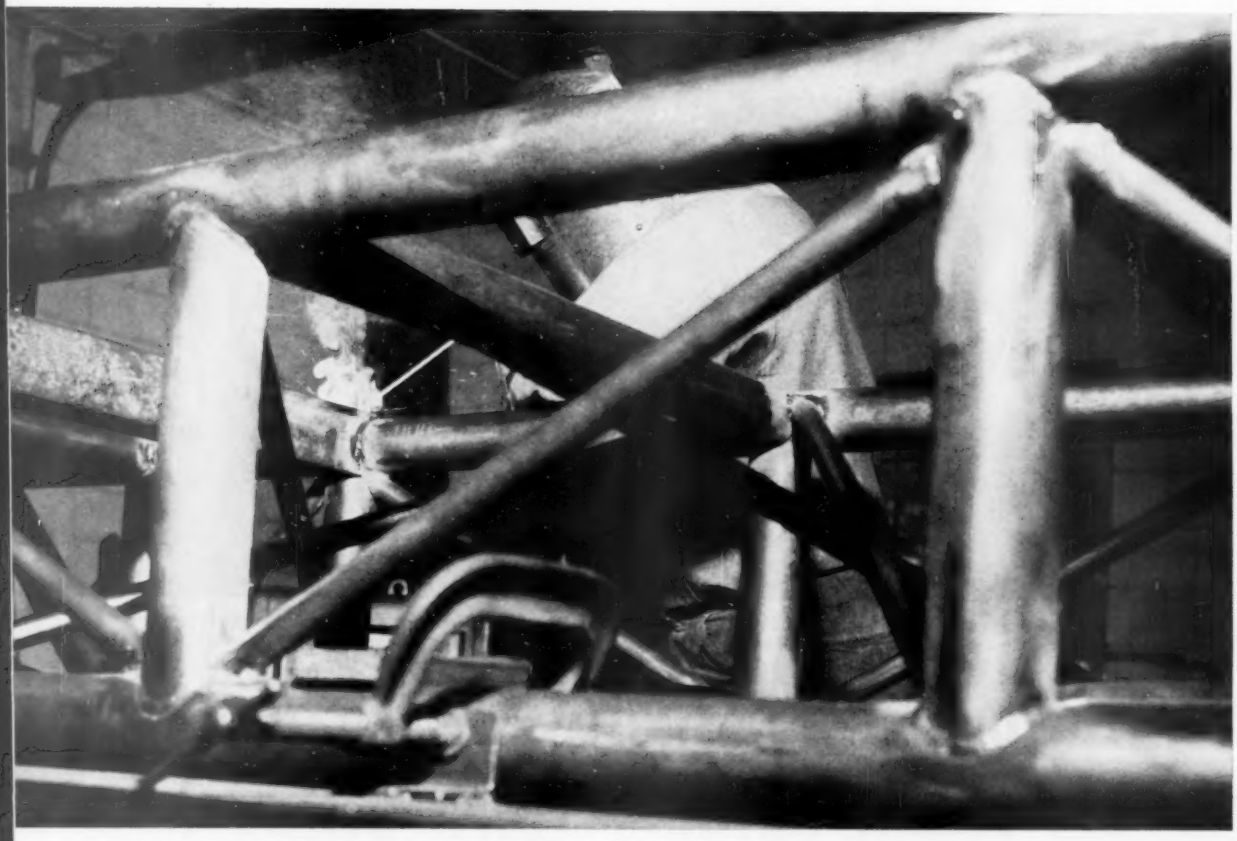
Exclusive, full-time arc force control permits welding with shorter arcs than are possible with any other rectifier welder.

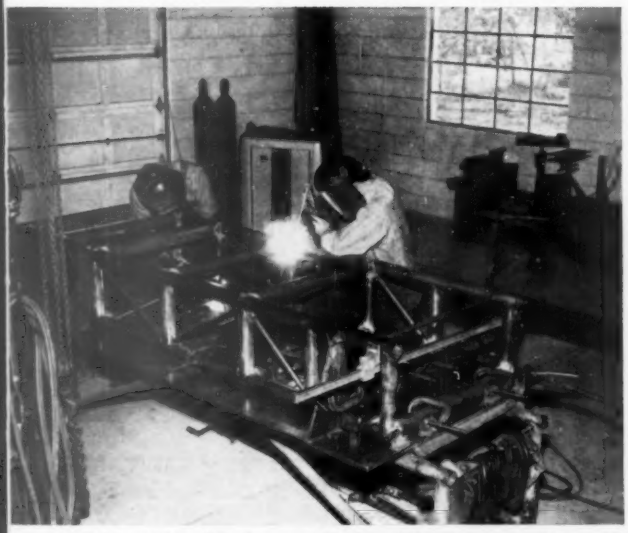
The large, easy-to-read current scale is expanded at the lower range. It allows for pinpoint settings at these lower ranges, where accuracy is most important.

For more information see your nearest General Electric Welding Distributor. He is listed in the yellow pages of the telephone book under "Welding Equipment, General Electric." Or write directly to Section 711-7, General Electric Company, Schenectady 5, New York.

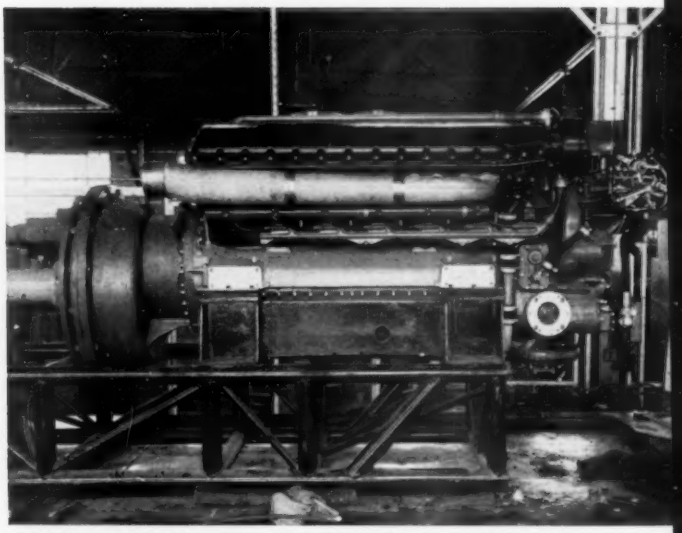
GENERAL ELECTRIC

with General Electric rectifier welders





Weldors Kurt Mueller and William McWilliams finishing off an engine mount. It consists of 85 separate pieces of tubing requiring 172 individual welds varying from one to 30 inches long. Tolerances are $\pm\frac{1}{64}''$ high and $\frac{1}{32}''$ wide. Metal used is 10-gage seamless tubing, AISI 1015 steel, .25 carbon.



A 1400-pound, 1500-horsepower engine on frame welded with G-E rectifier welders and electrodes. Engine and frame are placed in truck bodies and used with other equipment for work in increasing flow of oil wells. Welded frame must be able to withstand terrific vibration encountered in field operation.

For the tough job of fabricating the steel framework of the Recreation Bowling Center of Houston, Texas, Southern Steel Erectors uses General Electric engine-driven welders. Low maintenance features impress company owner, Mr. R. O. Matthews.

Contractor picks General Electric welders for his tough outdoor construction jobs

Southern Steel Erectors, a Houston, Texas contractor, demands welding equipment that is tough enough to withstand the punishment found in outdoor steel framework construction.

No wonder, then, that R. O. Matthews, owner of the firm, now specifies General Electric engine-driven welders for his welding jobs.

He finds that with General Electric equipment, repairs no longer cause cost-consuming downtime for his company. Some of the reasons for this are:

- **Extra-heavy-gage metal construction minimizes accidental damage.**
- **No exciter is required. A potential trouble spot is eliminated.**
- **Constant-pressure brush springs and pre-set brush holders require no adjustment—are factory set.**
- **Pre-lubricated bearings all but eliminate bearing maintenance.**
- **Steel driving disk holds generator exactly in line with engine shaft—has no expendable parts.**

Weldor E. D. Keck says that during his 15 years as a weldor, using nearly every make of equipment, he has found the new General Electric engine-driven welders are the easiest to use and produce the best welds.

Mr. Matthews also says, "This G-E engine-drive has more power than other welders, and we save on fuel, too. We use only one gallon of gas per hour. Also, I like its adaptability to a wide range of rod sizes."

Weldor E. D. Keck says, "I've found in my 15 years as a weldor that the new G-E engine drive gives you a better weld—easier, because there is no fluctuation. All you do is set the machine and it will remain true and constant."

General Electric's new line includes three sturdy ratings, 200, 300, and 400 amperes. For more information contact your nearest General Electric Welding Distributor, listed in the yellow pages of the telephone book. Or, write section 714-6, General Electric Company. Schenectady, New York.

Don't miss the General Electric display at the AWS Welding show April 9-11 at Convention Hall in Philadelphia. The display will be in booth No. 322.

GENERAL ELECTRIC

BETWEEN PASSES

champ, yet apprentice

He may have gained the middleweight boxing title early last month, but Gene Fullmer is still an apprentice weldor in the Kennecott copper mine at Bingham, Utah. After taking the title from Sugar Ray Robinson, Fullmer was quoted as saying that he would take a week's rest, then return to his job as weldor. "I like to work, and I like to fight," the newly-crowned champ said.

helium and welding

In last month's issue of *Welding Engineer*, an article based on a bureau of Mines report showed that nine states account for over 95% of private helium consumption. Of this private consumption, more than 64% was used for shielding in Mig and Tig welding processes. We note that all nine states are among 13 states representing 80% of the welding market, adding further proof to the accuracy of our Research Dept.'s report which appeared in the Nov., 1956, issue.

atomic progress

Peacetime atomic activity in the United States has grown to such a degree that the atom can no longer be considered an infant. A progress report issued by the Atomic Industrial Forum points out significant developments in commercial applications. Among them: the fact that 134 industrial firms began using radioactive isotopes in 1956 for the first time. Of this number, 28 companies obtained them for radiographic inspection.

the art of welding

A welding-equipment manufacturer has recognized the growing importance of the oxyacetylene torch as an art tool, and of welded sculpture as an art medium. Linde Air Products Co. will award $300 for the best sculpture produced by torch and entered in the 1957 Chicago Artists Exhibition. The show will be held this month (Feb. 12-26) at Chicago's Navy Pier. Linde hopes to stimulate further interest in the oxyacetylene flame as an art tool. Although a Linde representative will serve as technical advisor, selection of the award winner will be left in the hands of an independent art jury. The work is limited to 7 ft in height and 1,000 lb in weight. Entries are open to sculptors 18 or over who live in Illinois within 100 miles of Chicago.

hit the road . . . again

Our peripatetic publisher, Ted Jefferson, recently delivered his 200th talk before a section of the American Welding Society. The milestone was reached at Milwaukee in December. Ted has hit the banquet circuit hard this season, after almost two years of seeming inactivity (as far as speechmaking goes, anyway). He also spoke before the NWSA Birmingham meeting in December and is on the Western Metal Congress program in March.

help wanted

And lots of it. Every time we pick up a newspaper, we find more and more firms advertising for welding engineers and kindred titles. *Welding Engineer*, too, has had many requests for leads on men who wish to change jobs. It is definitely an employee's market at this time.

answer postponed

It's seldom we have to renege on a promise, but here is an instance. We told our readers last month (p. 59) that we would publish this month an article giving the acetylene side in the propane *vs.* acetylene controversy. It now becomes necessary for us to postpone this article for a short time. Watch for it!

always anonymous

A reader from Tennessee, afraid or ashamed to put a signature to his letter, recently gave the editor a piece of his mind. He was more than just a little irritated with the November editorial because he did not read it as carefully as he should —or maybe because he hasn't been doing a "day's work for a day's pay." To see publication in our "letters" column, your correspondence must be signed; otherwise it goes into our circular file.

what???

Welding Engineer's editorial stand on numerous code restrictions is well known. We're agin 'em. But we were somewhat surprised to learn that lumber manufacturers and carpenter union leaders are urging a "vigorous campaign to wipe out restrictions" against the use of lumber and wood products in building construction. We'd like to point out to our "wooden" competition that "they never had it so good." And if they want to know frustration, let them get into our industry, where even those who should know better (societies) continue to place obstacles in the path of progress.

spoilsport

We've heard of some party poopers in our day, but our nominee for a top spot in their hierarchy is a Cincinnati detective, who recently spoke on "How *not* to behave at a convention" (our italics). This officer, a member of the vice squad yet, was guest speaker before the American Electroplaters' Society. However, we see that when he spoke in December, it was ladies' night for the Cincinnati AES chapter. Could it be that the fellows were trying to impress their fraus?

Now you can get both! ... the ability to weld problem steels
... the cost-cutting speed of iron powder

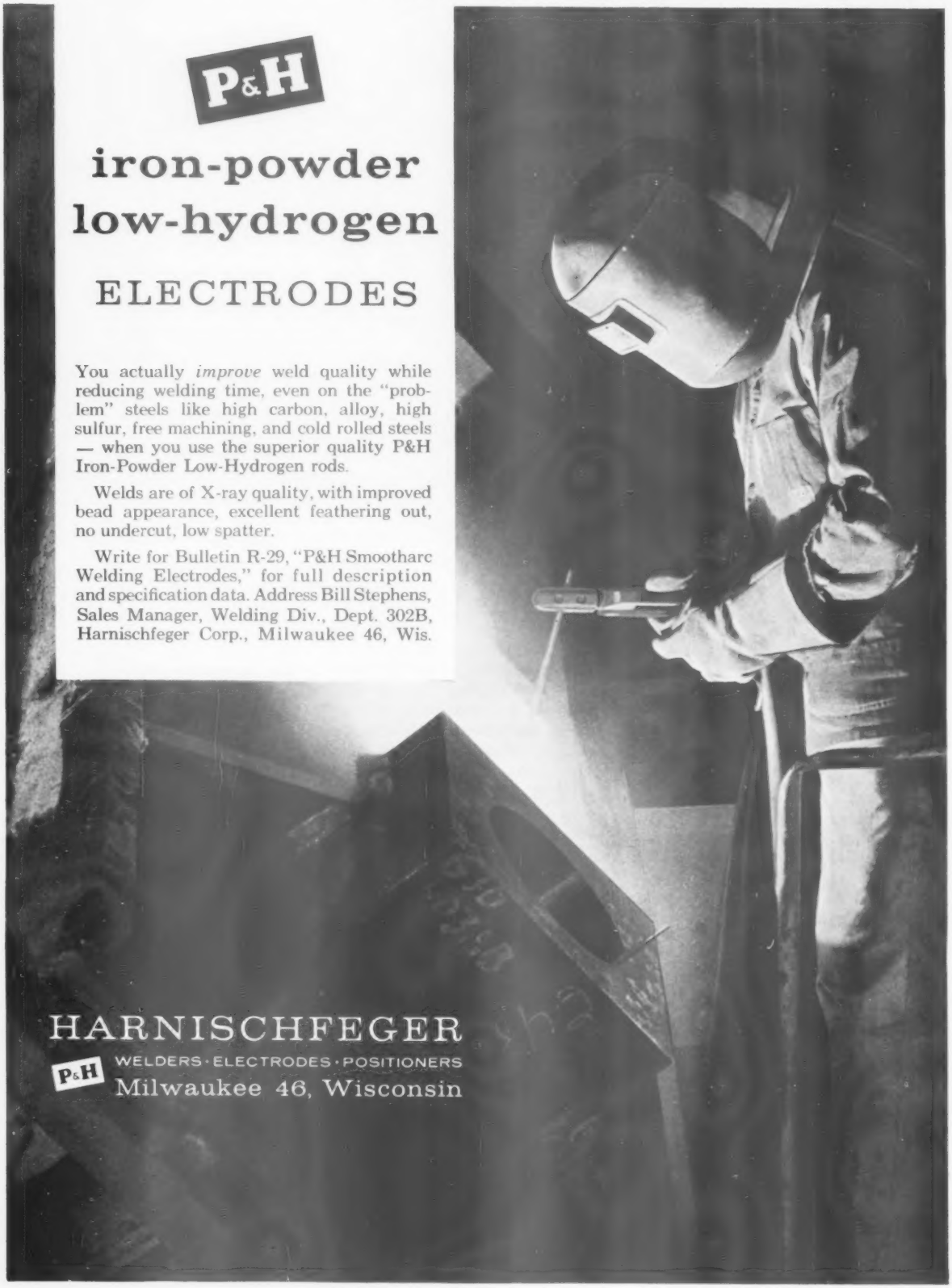
P&H

iron-powder low-hydrogen ELECTRODES

You actually *improve* weld quality while reducing welding time, even on the "problem" steels like high carbon, alloy, high sulfur, free machining, and cold rolled steels — when you use the superior quality P&H Iron-Powder Low-Hydrogen rods.

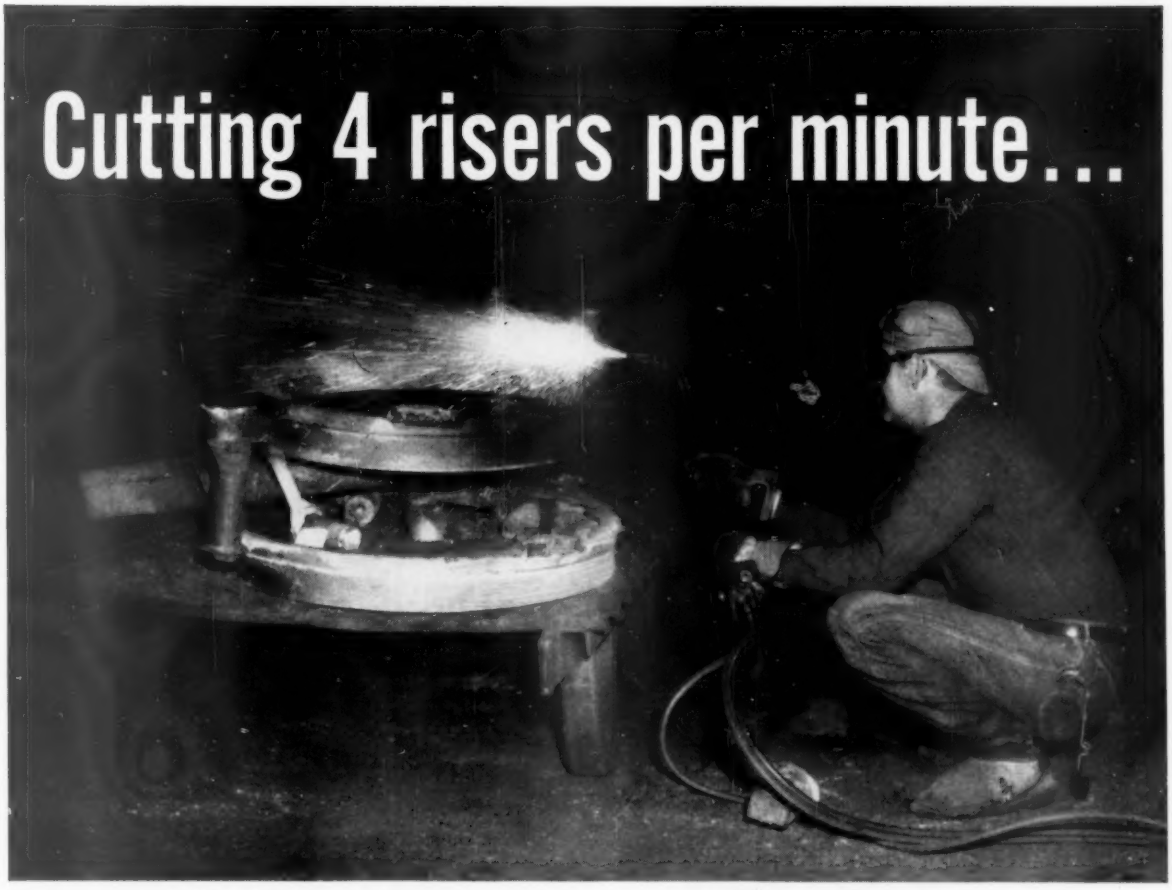
Welds are of X-ray quality, with improved bead appearance, excellent feathering out, no undercut, low spatter.

Write for Bulletin R-29, "P&H Smootharc Welding Electrodes," for full description and specification data. Address Bill Stephens, Sales Manager, Welding Div., Dept. 302B, Harnischfeger Corp., Milwaukee 46, Wis.



HARNISCHFEGER
P&H WELDERS · ELECTRODES · POSITIONERS
Milwaukee 46, Wisconsin

Cutting 4 risers per minute...



Lightweight and easy to handle, this OXWELD powder-cutting blowpipe makes fast work of risers.

Powder-Cutting speeds removal operations 300%

Removing risers from stainless steel castings need no longer be costly and time consuming. Pictured above is a typical powder-cutting operation at the Ohio Steel Foundry Company, Springfield, Ohio. Here, 2 by 4 inch thick stainless steel risers are removed by powder-cutting in only 15 seconds. By methods previously used, this operation took up to four times longer.

In the powder-cutting process metal powder is automatically injected into an oxygen flame to increase the flame's heat and severing action speed. The powder process is helping users gain new efficiency and speed in the removal of gates and risers, sand incrustations, and casting defects.

The powder-cutting blowpipe used in this operation, an OXWELD AC-4, is designed for hand cutting of oxidation resistant metals such as stainless steel, chrome alloys, and cast iron. Heavier apparatus is also available for manual and mechanized operations.

Increase your production and profit—call your local LINDE representative, or write for illustrated literature on LINDE's modern processes. Start saving now, do it today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

Linde Trade-Mark

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When a low-hydrogen electrode . . .

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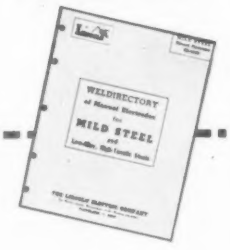
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FEBRUARY, 1957

Welding Engineer

ESTABLISHED 1916

Every knock isn't a boost

WELDING and flame-cutting recently were given several prominent newspaper write-ups.

We were happy to note that "acetylene torches" saved the lives of several passengers trapped in the wreckage of a Chicago elevated train. Reporters may never learn that cutting was done by an *oxyacetylene* torch, but the credit given, for a change, was favorable.

Publicity on welding and flame-cutting is generally detrimental. But remember that the *processes criticized so severely are almost never at fault*. Operators may accidentally cause fires—true. But what about supervisory and management people who should have enforced the rules of fire prevention?

Safety is everybody's business—not just that of weldors and flame-cutters. These men need the continuing cooperation of *all* plant personnel connected with fire prevention to achieve real safety in operation.

The International Acetylene Association has developed a few simple rules that everyone associated with welding activities should know.

THESE are the rules. Memorize them!

1. Never use cutting or welding equipment where sparks or open flame could be a hazard.

2. Before cutting or welding in a new location, check with the nearest foreman on possible fire hazards you may have seen.

3. When flame-cutting is used, move combustible material at least 30 ft from the torch.

4. Use sheet metal guards, asbestos, or any other *fireproof* material to keep sparks in the immediate work area. Don't use tarpaulins!

5. Sweep floors clean before lighting the torch. Wet down wood floors.

6. Protect oxygen and acetylene hoses from possible damage. Acetylene escaping from a broken hose can spell disaster.

7. Do not weld or cut tanks that have held gasoline or other flammable liquids without first taking special precautions. If you are unacquainted with these precautions, write the International Acetylene Association, 30 East 42nd St., New York (17); the American Welding Society, 33 West 39th St., New York (18), or WELDING ENGINEER.

8. Be prepared to stop a fire promptly. Fire extinguishers, water hoses or pails of water and sand should be ready for instant service.

HAD RULE NO. 1 been observed, a recent mission of mercy undertaken by flame-cutters would have been reported in different fashion. A train-truck collision in Indiana derailed a locomotive; the engineer and fireman were trapped in the cab and killed.

In an attempt to reach the bodies, a torch operator cut into a diesel fuel tank. Result: two more dead and seven seriously injured.

Rule No. 2, firmly in the minds of flame cutters and their supervisors working on a Brooklyn pier stacked with explosives, would have saved 10 lives and prevented injury to nearly 250 persons. It could also have prevented a $15 million loss.

Had all the rules been memorized and carefully followed, the public would not now be reading a report from the National Board of Fire Underwriters. This group states that, in 1955, "of 225 building fires in the U.S. and Canada where individual fire loss exceeded $250,000, welding and flame-cutting operations were responsible for as many fires as any other single cause."

It isn't enough that we say to ourselves "these fires aren't really our fault." If those responsible for fire prevention around welding and cutting operations don't have the foresight to do their job well, then we of the welding industry will have to do it for them.

Through cooperation and education, 1957 can be welding's safest year—though more people than ever will be using industry's most useful and indispensable processes.

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33

VICTOR EQUIPMENT COMPANY

ALLOY ROD AND METAL DIVISION

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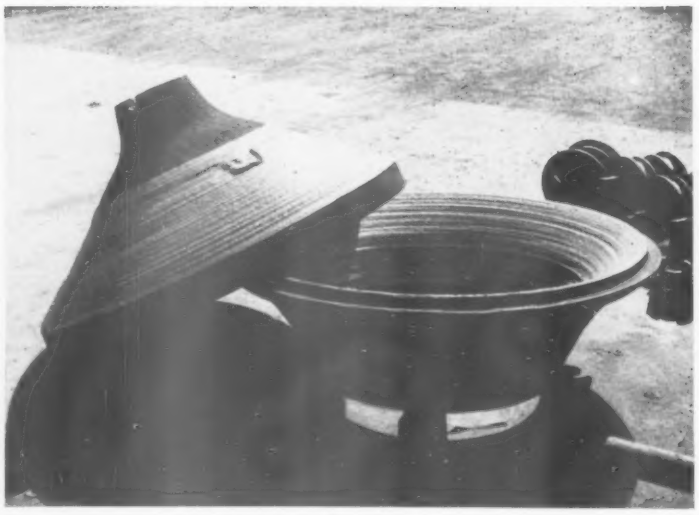
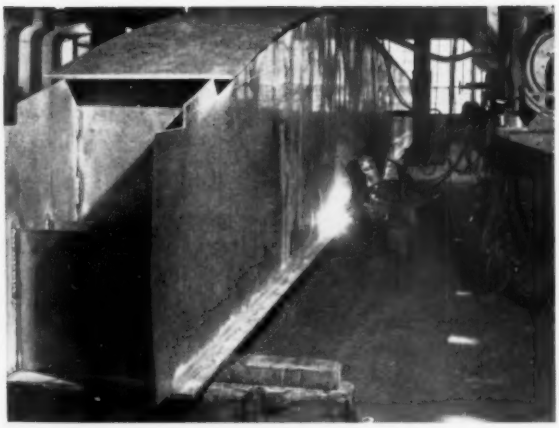


Note even deposit of Victor VA#3 automatic rod on gyratory crusher cones.

TYPE	USES	PROPERTIES AND APPLICATION
VA#1	Crusher Rolls Gyratory Crushers Crusher Mantels Scraper Blades	Rockwell 'C' 54-57 Impact Resistance—good Abrasion Resistance—high AC-DC submerged arc or DC open arc
VA#2	Pinch Rolls Tractor Idlers Tool Joints Coiler Rolls	Rockwell 'C' 50-52 Impact Resistance—good Abrasion Resistance—good Submerged arc only Suitable for multiple passes
VA#3	Roll Crushers Gyratory Crushers Impellors Mill Guides	Rockwell 'C' 54-57 Impact Resistance—good Abrasion Resistance—high For use where abrasion is severe Submerged arc only
VA#4	Tractor Rollers Sheave Wheels Tractor Idlers	Rockwell 'C' 25-28 Impact Resistance—excellent Abrasion Resistance—good Submerged arc only Suitable for multiple passes Machineable
VA#5	Tractor Rollers Sheave Wheels Tractor Idlers Grader Blades	Rockwell 'C' 34-38 Impact Resistance—high Abrasion Resistance—good Suitable for multiple passes Submerged arc only
VA#6	Crane Wheels Roll Necks Pump Sleeves	Rockwell 'C' 38-41 Impact Resistance—high Abrasion Resistance—fair Suitable for multiple passes Deposit machineable Submerged arc only
VA#7	Excellent base for high alloy application. Mine Car Wheels	Rockwell 'C' 36-42 Impact Resistance—excellent Abrasion Resistance—good Suitable for multiple passes Deposit machineable Submerged arc only
VA#8	Tool Joints Grader Blades Scraper Blades Roll Crushers	Rockwell 'C' 51-54 Impact Resistance—high Abrasion Resistance—high Submerged arc only
VT#60	Tool Joints Grader Blades Scraper Blades	Automatic Tungsten carbide wire Abrasion Resistance—excellent (maximum) Deposits are heterogeneous Open arc—DC reverse only

Rod diameters 1/8", 5/32" and 3/16". Standard coil size, 22-1/2" inside diameter, 4" wide, approximate weight 100 lbs.



ALUMINUM crane girders at Kaiser's Ravenswood plant were assembled as follows: Diaphragms were welded to top cover, and first and second webs were tack welded to diaphragms and top cover. Girder was then turned on its sides and final welds joined webs to diaphragms. After being laid with pre-set camber, bottom cover was tack welded to webs. Webs were then continuously welded to top cover (as shown in pictures left and above) and bottom cover.

First in U. S.

Mill-type cranes are made with welded aluminum

INSTALLATION of 27 welded, all-aluminum, mill-type cranes—first of their kind in the U. S.—is being completed in Kaiser Aluminum & Chemical Corp.'s new sheet, plate and foil rolling mill at Ravenswood, West Va.

Kaiser's new high-strength, weldable aluminum alloy 5083 was used by Cleveland Crane & Engineering Co., Wickliffe, Ohio, for construction of crane girders and components. By employing high-speed welding and flame-cutting techniques, the firm reported that fabricating costs of aluminum were the same as steel.

The Ravenswood cranes, ranging in capacity from 5 to 125 tons and in span from 60½ to 105 ft, will be used for a variety of tasks.

Crane Cost Factors

They were ordered only after thorough engineering and economic studies of crane applications in mill operations. Prior to final design, Cleveland Crane, which built the original cranes, confirmed engineering calculations by making strain-gage tests on a 10-ton half-scale model with a 50-ft span.

Although aluminum cranes generally cost 3 to 8% more than steel cranes built to the same specifications, Kaiser believes they may be competitive (or, in some instances, slightly less expensive) if these factors contributing to crane cost are considered:

(1) Reduced building costs in new construction or in modification of existing plants.

In new construction, reduced wheel loads of lightweight aluminum cranes permit savings on craneways, columns, footings and excavations. These savings are said to run as high as 4% of initial crane cost.

For example, a Kaiser comparison of two 105-ft-span aluminum cranes, one of 10-ton capacity and another of 50-ton capacity, with steel cranes of equal span and capacities showed the following: aluminum cranes were 49 to 54% lighter in total weight, and provided a 24 to 34% reduction in wheel loadings.

Plant expansions requiring installation of cranes of increased capacity involve modification of craneways and supports which usually costs more than new construction. This modification cost can be eliminated, says Kaiser, with installation of aluminum cranes, since their capacity can be increased 25 to 35% without increasing wheel loads.

Freight Savings

(2) Reduced freight costs to installation site. Although variables such as distance apply here, Kaiser estimates that savings on aluminum crane shipments will amount to 1½ to 2% of crane cost.

(3) Reduced installation cost. Lighter weight of aluminum crane girders and components simplifies handling and can reportedly reduce amount and capacity of equipment needed to install sections on craneways.

At Ravenswood, the contractor estimated erection cost of 50-ton steel cranes at 60 to 70% higher than similar aluminum models, and 100-ton steel cranes at 50% higher.

There is a direct relationship between initial cost and operating performance, Kaiser points out. Mill-type cranes are essentially overhead

material-handling conveyors. Therefore, work capacity per hour is important. The aluminum crane's reputed capacity for higher acceleration and deceleration at the same power input would give it a greater work capacity per hour.

Operating Cycle

An illustration of aluminum crane performance at a rolling mill was cited by Kaiser. The job here involved transfer of 10-ton ingots from soaking pits to a hot-mill conveyor table.

The purchaser specified a crane operating cycle of 90 seconds, based on time required to transfer an ingot from the farthest pit at a rate of 40 ingots per hour. A crane manufacturer said 120 seconds was the best operating cycle which could be achieved safely with steel cranes operating at bridge travel of 400 fpm.

With an aluminum crane using identical motor sizes, however, the same manufacturer estimated an 86.7-second cycle. Bridge travel was 535 fpm, which Kaiser believes is the fastest rate ever specified on a mill-type crane.

Trolley travel was 320 fpm and main hoist speed 85 fpm. In this specific case, the aluminum crane could do 25% more work.

Maintenance advantages of aluminum also affect operating performance. Since no painting is required, lost operating time and painting costs are eliminated. In addition, decreased wheel loadings reduce noise, destructive vibration and pounding of supports.

Girder Deflection

Cleveland Crane found it unnecessary to make any radical departure from steel design for aluminum mill-type cranes.

The major design consideration in converting from steel to aluminum was the difference in modulus of elasticity. The 1942 American Iron & Steel Institute specification allowed a steel girder deflection of 0.0015 per in. of span.

A recent revision of this specification reduced deflection to 0.001 in. to limit steel design stresses. However, since aluminum girders can accommodate greater deflection with extremely low design stresses, the 0.0015-in. deflection was re-established as a maximum.

Depth of aluminum girders was increased 25% to obtain desired deflection. Even with this depth, plus appropriate gage increase, aluminum girders were said to be 58 to 60% lighter than those of steel.

Design of components was conventional. Full and partial-depth diaphragms were used. Full-depth web plates were used with web and cover-plate joints at third points of the span. Reinforcing butt straps were placed behind web and cover-plate splices to reduce stress in the joint area and obtain camber adjustment in assembly.

Skip welds were specified to join top cover and webs to diaphragms; double-pass, continuous welds were designated to join cover plate to webs.

Mig Equipment

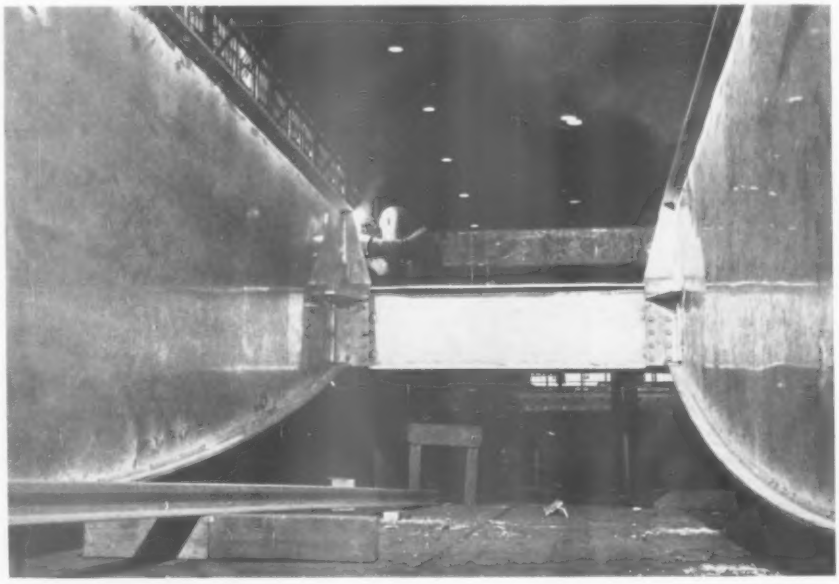
Mig (metal inert-gas) welding equipment, employed both manually and automatically in a gantry carriage with argon gas and constant-potential generators, was used with 5356 aluminum alloy filler wire. Six weldors were qualified after their weld-test specimens were evaluated and approved by Kaiser engineers.

Operating speeds of both manual and automatic equipment were found by Kaiser to be considerably higher on aluminum than on steel. On aluminum, the continuous web-to-cover automatic fillet welds were made at 20 in. per minute. This reportedly compares with a 15-ipm rate on steel.

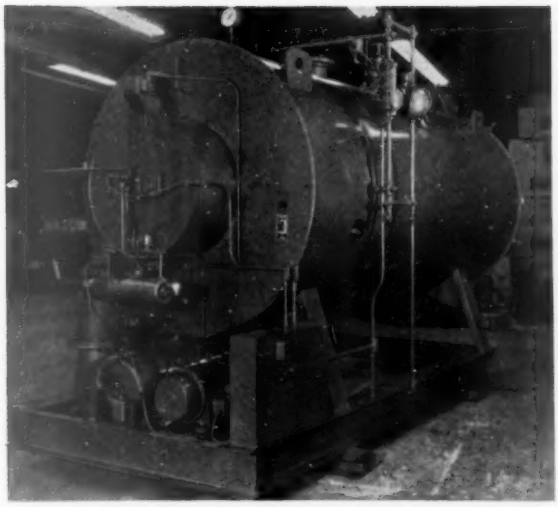
Costs of welding aluminum and steel were the same, says Kaiser, since added inert-gas cost was offset by higher welding speeds.

Shearing and forming costs were the same for aluminum and steel plates up to ½-in. thickness. Cost of sawing aluminum plates ½ to 2 in. thick, however, was found to be 4% higher than flame-cutting steel.

New torch-cutting methods for heavier-gage aluminum have eliminated this differential, and Kaiser states that fabricating costs for aluminum and steel cranes are now identical.



FINAL welding operations are completed at end of aluminum crane girders where saddles are shown installed. Ravenswood cranes, ranging in capacity from 5 to 125 tons and in span from 60½ to 105 ft, will be used for variety of materials-handling tasks. Reduced freight and installation costs are among advantages cited for aluminum cranes.



COMPLETED 200-hp boiler is ready for crating. Components at front include blower wheel and housing, blower motor, air compressor and auxiliary oil circulating pump.

STRAIGHTLINE cutting machine is used by operator to flame-cut leg part. Shell plate is cut to size and squared with this machine. Ordinarily, edges are not beveled.

Welding turns out boilers in a package

By Clyde B. Clason

An important job in the welding department of York-Shipley, Inc., East York, Pa., is fabrication of "Steam-Paks"—packaged steam generators.

Since preassembly of a boiler and its many auxiliaries into an integrated package is becoming increasingly popular with industrial customers, the firm devotes one-quarter of its manufacturing floor space to fabrication and assembly of such boilers.

In addition to applications on longitudinal seams of the boiler shell, welding is used to join tube sheets and end flanges to the shell, to add the center fire tube, to install fittings and connections, and to join the shell to its skids.

Boiler, burner, combustion chamber, forced draft, insulation, sheet-metal casing, piping, condensate system, prewired panel and safety controls are all in the self-contained package.

3-Pass Construction

The steam generators are horizontal boilers of the Scotch-marine type. Combustion chamber is within the boiler shell. Tubes through which heated gases travel are also submerged below water level.

Nearly all these boilers are of three-pass construction. First pass is through the central combustion chamber, second pass through the bottom tube bank, and third pass through the top bank.

York-Shipley manufactures three basic series of oil-burning and/or gas-burning packaged steam generators: low-pressure, high-pressure and hot-water.

The low-pressure series operates at 15 psi standard, the hot-water series at 30 psi standard, and the high-pressure series at 125 psi standard. Higher pressures may be obtained on special order. Nineteen capacities provide a power range from 10 to 500 hp.

For boiler fabrication, the welding department employs 4 flame-cutters, 8 weldors, a shop inspector, an X-ray inspector, and an ASME Boiler Code inspector.

Center Fire Tube

Dimensions of the many components involved naturally vary with boiler rating. To provide a specific example, all dimensions in this article will, unless otherwise specified, pertain to the 30-hp boiler.

This fairly common size provides 177 sq ft of heating surface and has a steam output of 1,005 lb per hour.

Its shell is 42 in. ID by 79 in. long. Raw material is 5/16-in. grade "A" SA285 flange-quality steel. The same material is used for the center fire tube and for tube sheets.

Shell plate is flame-cut to size and proper squareness with a motor-driven, straightline cutting machine. Oxygen is used at 20 to 50 psi, and acetylene at 4 to 10 psi.

For this particular boiler, plate edges are cut without bevels. Usual practice is to cut two edges and make use of two mill-formed edges, which are generally accurate enough for welding.

The operator punches a row of marks to indicate required edges and scribes straight lines between punch marks to guide the cutting machine.

WELDOR watches progress of inside longitudinal weld. Semiautomatic welding head is mounted on cutting-machine carriage.

Perfect Roundness

A shape-cutting machine, operated within the same range of oxygen and acetylene pressures, is employed to cut out smaller parts and fittings. This machine is guided by a magnetic tracer.

Flat plate is fed between three rolls on a pinch-roll machine to be curved into a cylinder. The initial pass enters and breaks the plate. The plate is then turned 180 deg and fed in from the other end. Rolling continues back and forth until a cylinder of perfect roundness has been attained.

The pinch-roll machine is able to take plate up to ½ in. thick by 10 ft long, and can roll cylinders from 14 to 60 in. in diameter. Rolls are adjusted for shell diameter by moving them closer together or farther apart; the farther apart they are set, the larger will be the diameter of cylinders being rolled.

In the welding department, the longitudinal seam is manually tack welded with 5/32-in. E6020 electrodes. Finish welding inside and out is done by automatic submerged-arc using 5/64-in. mild-steel core wire and a granular flux.

The rig for automatic welding was designed and built at the East York plant. Welding head is a semiautomatic type, but it is mounted on a cutting-machine carriage for automatic travel.

Second Pass Made

The shell is positioned on rollers to place the seam at the bottom, and the inside pass is made at a speed of 12 ipm using a current of 650 to 700 amp.

The second and final pass is made outside. The shell is turned 180 deg to bring the seam to the top, and the welding head is set for travel at 22 ipm. The same welding head, wire and current are used. No slag cleaning is necessary after inside or outside passes.

If the boiler is a low-pressure type, the shell goes immediately to assembly.

The assembler, a qualified weldor, has a complicated and exacting job. He lays out and cuts openings for fittings with an oxyacetylene hand cutting torch, cleans off slag from within the openings, assembles a total of 17 fittings, and tack welds them into place from outside with 5/32-in. E6020 electrodes.

Finish Welding

He also finish-welds fittings from inside the shell. Afterward, he assembles and tacks drilled tube sheets at either end of the shell and tack welds them to the central fire tube. This tube is an inner cylinder which, for the 30-hp boiler, is 67 in. long with a 15-in. ID.

The assembler completes his 8-hour job by assembling and tacking the two flanges.

An overhead crane carries the shell to a positioner to receive finish welds. The positioner holds the shell at an angle between 10 and 15 deg and rotates it for circumferential welds of tube sheets and end flanges.

This welding is done manually, using 5/32-in. E6020 electrodes for root passes, and 7/32-in. E6020's for final passes.

After circumferential welds are completed, the positioner drops the shell from a tilted to a horizontal position for outside welding of boiler fittings. Current for this finish welding may range from 120 to 300 amp, depending on thickness and job involved.

The ASME Boiler Code requires X-ray inspection of longitudinal seams on high-pressure boilers. This is done before assembly of fittings and tube sheets by an industrial X-ray unit.

Film loading is done in a basement darkroom. Industrial safety film is inserted within 4½ by 17 in. X-ray screens.

Loaded screens are taped along the seam inside the boiler shell. This shell has been laid on a pair of stationary rollers and positioned so that the seam is 90 deg from the vertical. Lead penetrameters and lead numbers are affixed outside.

Lead Screen

The X-ray tube shoots against an outside plant wall. A heavy lead screen against the wall absorbs scattered radiation and protects passersby

outside the building.

An exposure may take 1 to 2 minutes, depending on plate thickness. After a 17-in. strip has been exposed, the X-ray unit is centered for the next strip.

Exposed films in their shields are taken to the darkroom, unloaded, developed and dried. They are then viewed on a lighted screen.

Ten classes of defects are cause for chipping out and rewelding: *(1)* insufficient penetration; *(2)* slag inclusion; *(3)* porosity; *(4)* cracks; *(5)* weldor inaccuracy; *(6)* undercutting; *(7)* rough weld; *(8)* weaving; *(9)* weld crater, and *(10)* inclusion other than slag.

As evidence of weld quality at York-Shipley, only one defect was spotted in films exposed on 14 shells, each 6 ft long—1 in. of defective welding in 84 ft.!

Stress-Relief Oven

Approved by X-ray, high-pressure boiler shells receive fittings, tube sheets and end flanges as previously described.

They are then sent to a stress-relieving oven. A temperature of 1,200 F is held for one hour, then dropped gradually. At 300 F, the boiler is removed from the oven and left in the open to cool to room temperature. Low-pressure boilers are neither X-rayed nor stress relieved.

High-pressure boilers following stress relief, and low-pressure boilers after finish welding of fittings and tube sheets, are joined to skids.

For the 30-hp boiler, this base subassembly is a rectangular framework 48 in. wide by 82 in. long, constructed from 8-in., 13.75-lb. channels. Two angle stiffeners 48 in. long run crosswise across the length.

After base subassembly has been completed, shell and base are leveled and four legs are assembled and welded. A perfect horizontal level must be secured before welding is done.

Watertight Seal

Legs for the 30-hp boiler shell are constructed of 6-in., 10.5-lb channels, each 23½ in. long. Welding is done with 5/32-in. E6020 electrodes, using approximately 150 amp. Legs are tacked into place and welded solidly, first at the bottom to the base, then at the top to the shell.

The 30-hp boiler has 60 tubes—24 at top and 36 at bottom—each with 2-in. OD and 13-gage wall thickness. These are inserted through drilled holes in tube sheets.

After making sure that a tube is equally spaced between front and rear sheets, the tube assembler *rolls* it at each end to make a watertight seal with the tube sheet. Rolling is done by an air-driven portable expanding tool. This expander spreads tube ends for a distance of about 1½ in.

Beading or hammering with another air-driven tool from outside smooths rough edges and eliminates fire cracks. Since beading has a tendency to loosen tubes, they are rolled for a second time to assure tightness.

Pressure Doubled

After tube installation, the boiler is tested hydrostatically. In preparation for a hydrostatic test, all fittings are closed with cast-iron plugs and caps. Fill hose, drain hose and venting connections are hooked up, and water is heated to 90 F before use.

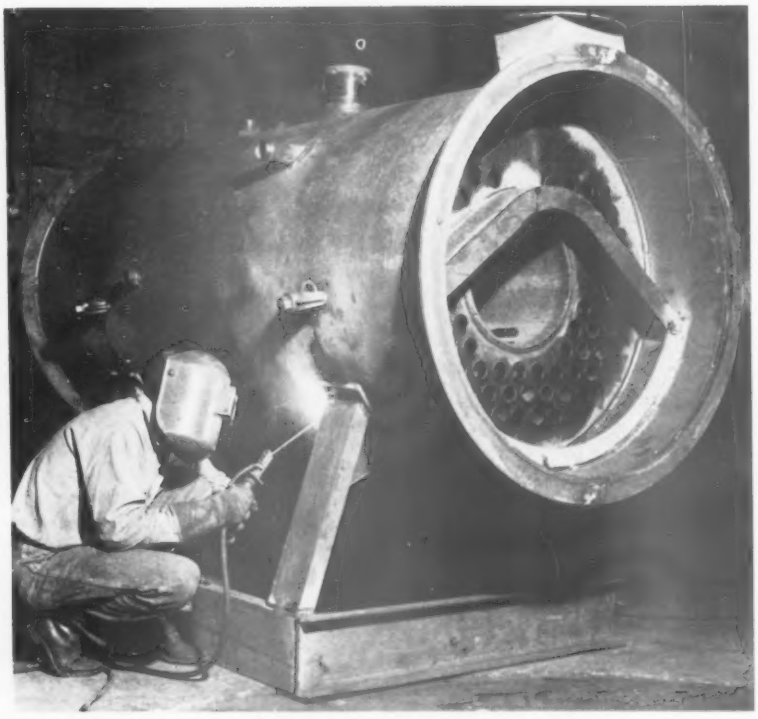
Low-pressure boilers are tested at 60 psi and high-pressure boilers at 300 psi. In each case, test pressure is double the boiler's working pressure.

When the dial indicates correct test pressure, tube surfaces, welded seams, joints and couplings are examined. If the boiler is sound, it is drained and stripped of caps and plugs. The shell now goes to an outdoor storage yard to await final assembly.

Shells are brought in from the storage yard as needed to fill purchase orders. They travel on dollies down an assembly line. There are over 300 boiler models, each of which may be altered in many ways.

To keep details straight from beginning to final assembly, an opera-

BELOW: Technician affixes lead numbers in preparation for X-raying. He stands 20 ft away when portable X-ray machine is turned on. Lead screen near shell absorbs radiation. LEFT: Inspector points to defect indication on film strip. Defects of any kind are seldom found.



AFTER stress relieving, high-pressure boilers go to skidder to be joined to their legs and base. Perfect horizontal level must be secured before welding is done.

tor's work card is hung upon the shell as it starts its journey. This tells workers at each production stage what to do and what materials to use.

Sheet-Metal Screws

An early assembly step is application of insulation. Large sheets of 2-in. thick fiber glass are scribed and cut into strips. The narrow strips, easily handled by a single worker, conform readily to shell curvature and boiler fittings. An adhesive is sprayed on the boiler surface and on insulation before it is pressed into place.

A casing of sheet steel covers insulation. The 22-gage sheets are cut in sets by press-driven shears and dies, then rolled to proper curvature.

The outer jacket is fastened temporarily by steel straps; permanent fastenings are sheet-metal screws driven through overlapping sheet ends. The baffle separating second and third passes of boiler tubes is shaped from refractory plastic. To form the combustion chamber, the central steel tube is lined with blocks of silicon carbide—a material able to withstand a temperature of about 4,000 F. Blocks are fitted with tongue-and-groove joints and cemented in place with fire cement.

Deep within the fire tube, a *target* ring is made by joining tapered silicon carbide blocks. Purpose of the target is to shape the flame and give its components a final mix to insure complete combustion. More silicon carbide blocks are cemented together at the boiler's front end to build the air cone refractory surrounding the burner head.

Burner design varies according to fuel. These packaged boilers are designed to fire light diesel oil, heavy fuel oil, heavy preheated fuel oil, manufactured or natural gas, or any selected combination of oil and gas.

Combustion Seal

A sheet of asbestos millboard provides a combustion seal and insulation at the boiler's front end. The windbox gasket is fitted over studs on the steel cover plate.

The heavy steel windbox is bolted against this gasket. The windbox, a plenum chamber, holds air delivered by forced draft and imparts a spiralling motion to air entering the flame.

The boiler's rear head, and the davit upon which it swings, are nosed into the assembly line by power truck. Tapered wedge pins are driven to hold the head in closed position. These pins may be easily knocked out to allow the head to be swung open for tube cleaning.

Electronic Brain

A preassembled chassis is mounted and welded in place. It includes blower wheel and housing, blower motor, air compressor for oil atomization, and auxiliary oil circulating pump.

Subsequent assembly includes addition to fuel oil preheating (for a certain type of burner only), oil viscosity compensator, duct connection between blower and windbox, pipe hook-ups and the prewired control panel. This panel, the boiler's electrical nerve center, is complemented by an electronic brain that programs the operating sequence.

When all working parts are in place, the boiler is given a firing test that duplicates normal operation under field conditions. It starts up, modulates its flame, or shuts down in automatic response to changes in load pressure.

A photoelectric eye scans the main flame constantly to make sure it is actually on the job. Should the flame fail, fuel is shut off in two to four seconds. Similarly, the fuel valve is prevented from opening at start-up unless the pilot flame is burning.

If the firing test proves satisfactory, the packaged steam generator is moved into the paint room. Rust and grease are cleaned off, and two coats of paint are sprayed on all visible surfaces.

Cost Reduction

All parts except boiler casings get one coat; casings get two coats in succession. Parts initially painted then receive a second coat. Normal air drying is fast enough to keep painting in pace with other production operations.

Moving out of the paint room, the boiler is crated for shipment.

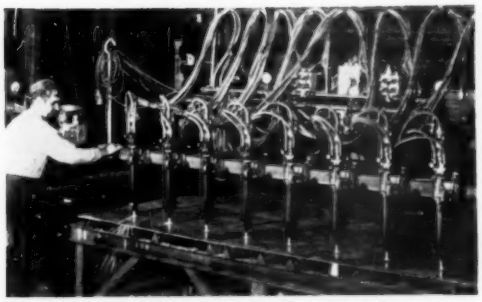
From York-Shipley's point of view, one of the chief advantages of packaging is that production-line assembly may be maintained.

Preassembled boilers are becoming more popular because installation costs are cut. Packaged steam generators require no pit, no brick setting for foundations, no high stack, and no on-the-job wiring.

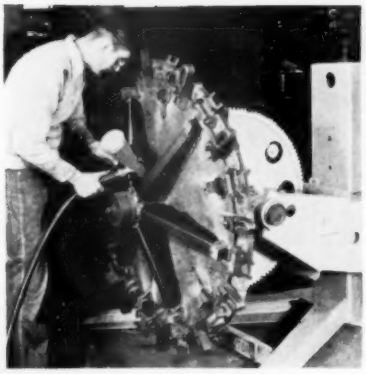
Basic design and engineering are entirely under the manufacturer's control. Field problems are minor and service difficulties greatly reduced.

This large manufacturer can prove that . . .

Welding improves truck mixer design



MULTIPLE-torch flame-cutting unit reduces steel plate to 8 water tank supports for transit mixer in a matter of minutes. Many other structural shapes are precision-cut with this oxygraph unit.



HEAD for mixer drum is positioned for economical downhand welding with semiautomatic submerged-arc method. Fixturing and positioning are stressed in Worthington welding operations on truck mixers.

POWERED turning rolls allow downhand welding of curved mixer blades in cone section of drum. This operation completed, cone and bottom drum section are joined by submerged-arc at a speed of 33 ipm.

By Paul Galton *and* **Joseph A. Barry***

Worthington Corp.
Plainfield, N. J.

THE TRUCK-MOUNTED concrete mixer *(transit mixer)* is a very important part of today's gigantic highway construction and building boom. To fill rugged demands of accelerated construction procedures, a modern transit mixer must be ready for continuous duty . . . under all sorts of climatic conditions and over all types of terrain.

From semiautomatic submerged-arc welding of a mixer's drum and head, to manual welding of chute and frame, various forms of welding are contributing to a better, more economical product. Without question, welding has enabled mixer manufacturers to come up with marked design and manufacturing improvements, and a more durable piece of equipment.

Payload is a critical factor in economical use of transit mixers. Welded fabrication, by replacing castings, has reduced net weight and increased payload capacity.

Unidirectional Flow

At Worthington's Plainfield Division, where a "Hi-Up" line of concrete mixers is fabricated, every phase of manufacture is geared for production-line work. In almost every procedure, welding performs an important function.

In planning shop facilities, each operation was laid out for a one-direction process flow. Machine tools are now adjacent to welding booths, resulting in uninterrupted production from raw material to finished machine.

All rough stores are prepared at one end of the plant; everything from structurals to sheet and plate is processed through layout, cutting, shearing and bending operations to suit requirements of the product in process. Radiagraph and oxygraph flame-cutting equipment is prominent in these operations for cutting structurals, drum head discs and ribs, manholes, and roller cradles and bands.

In addition, this section of the plant is devoted to shearing all flat plate and sheet, as well as contours. The latter operation is performed on a rotary shear.

In this operational phase, major sub-assemblies begin to take shape. The water tank is rolled and prepared for submerged-arc welding; hoppers and chutes are formed in a press brake, then fitted for manual arc welding.

Plates for mixer drum cone sections, and for bottom drum sections, are butt welded automatically. A submerged-arc welding gun, propelled along a tracked guide, is used. Completed sections are rolled to desired shape, and the drip ring, drum tire and wings are welded to the main drum assembly.

Drum Head Welding

Main pivot point for mixer drum rotation is the drum head. This vital component is subject to extreme stress; consequently, all welds on this assembly must offer maximum tensile strength.

Rib sections of the head, when flame-cut to size, are pressed into desired shape. A specially-designed

Mr. Galton is manager of Worthington's Positioning Equipment Division; Mr. Barry is general foreman of the truck mixer shop.

COMPLETED transit mixer, now a familiar sight in most areas of the U.S., delivers a load of concrete to roadbuilding project. Truck is quickly emptied to return for fresh material.

fixture locates ribs on the head disc. When clamping pressure is applied, a predetermined warp takes place to allow for expected distortion during welding. This eliminates straightening after welding.

After the assembly is properly clamped in the fixture, it is placed on a welding positioner. Each rib is tack welded to the disc, and the entire assembly is then welded in one continuous operation while on the positioner.

Prior to establishing this procedure, the operation took approximately 4 hours to complete. Use of the fixture, positioner, and the semiautomatic submerged-arc process in combination has reduced time to less than 2 hours per drum head. This includes necessary clamping and assembly time, as well as welding.

Efficient Rotation

The average mixer is comprised of hundreds of parts and assemblies. Each component's sole purpose is to help in efficient rotation of the drum, and equally efficient discharge of concrete. Great care must be taken during welding, and every operation is fixtured or positioned to insure proper fit-up and strong, uniform welds.

After all steel plate is joined and fitted, rolled drum sections are placed in a fixture for tack welding before final fitting and welding. A special vertical fixture then receives the two tack welded drum sections.

This fixture aligns cone section to bottom drum section for tack welding, and is adjustable for various drum sizes. The drum is now ready for final welding.

It is fitted to an 8-ton-capacity positioner where all welds are completed. Positioning is essential to this operation: it prevents improper weld deposits and flux run-off, and allows downhand welding of intricate blades inside the drum.

All girth welds are fillets joined at a rate of approximately 33 in. per minute, with 5/64-in.-diameter welding wire and agglomerated flux. Some longitudinal welds are done in the same manner, but with butted joints. A few shorter welds are done manually with iron-powder electrodes. At this stage, all inside welding is completed.

Drum Tire Welds

Accuracy is a prerequisite in fabrication of the drum tire. This carbon-steel wheel must withstand continuous rotative action of the mixer under chassis distortion and shock-load conditions. Material used for the tire is flame-cut from bar stock to required length.

Both ends are crimped to a proper radius in a hydraulic press and material is then rolled to required circumference. The open end is tacked, then completely welded, and again sent to a hydraulic press for straightening.

To accommodate cone contour, the tire is placed on a rotating positioner and beveled with a fixture-mounted radiagraph flame-cutting unit. This beveling procedure requires no subsequent machining, and its use has considerably reduced cost of the operation.

Prior to flame-beveling, tires were beveled on a vertical boring mill at a rate of one every five hours. Time has now been cut to approximately one hour, and to this is added savings in the cost of operating a relatively expensive machine tool.

The beveled tire and a drip ring are fitted and tack welded to the cone section of the mixer drum, using a fixture for proper alignment. Tack welds are spaced with a semiautomatic submerged-arc gun.

Final Assembly

Welding and fixturing is predominant also in fabrication of the water tank and flush tank, frame, pedestal and saddle, running boards, and a variety of brackets and flanges. Much of this work is manually arc welded, the rest is done by the semiautomatic submerged-arc method. In all instances, work is fixtured and positioned.

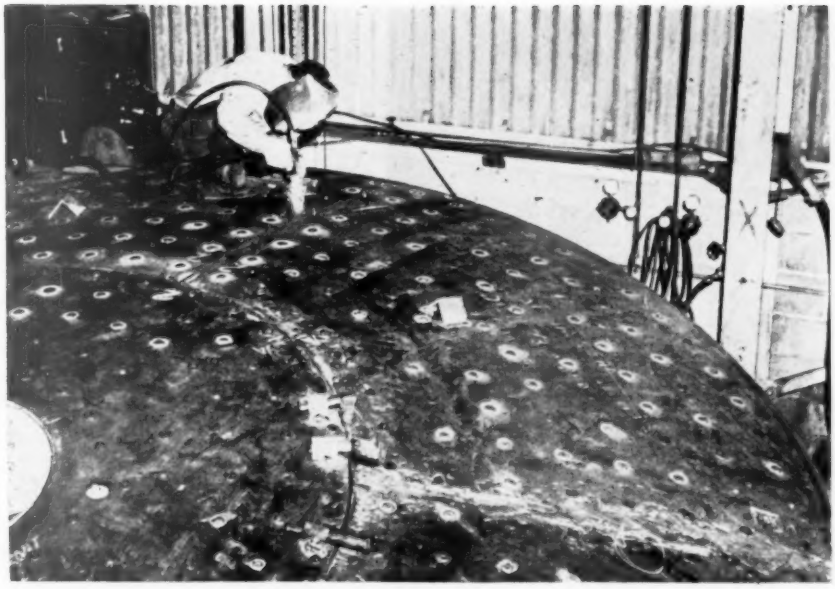
Prior to final assembly, the finish-welded mixer drum is placed in a special lathe for machining. The drum tire OD is machined and faced to assure proper alignment with the roller cradle assembly. Following this procedure, various sub-assemblies are ready for final assembly.

The roller cradle is set in place on an assembly fixture. The drum, with shaft trunnion bearing, is mounted and the power unit is then asembled to the main frame. At this stage, the welded water tank, chutes and hoppers are also mounted.

Throughout this procedure, progressive tests and inspections are made to reduce the possibility of rejects when complete machines are sent through final test and inspection.

The completed unit is given a rigid test and inspection by both an operator and an inspector. A check is made on the complete water system; the drum is tested for possible leaks; the power transmission unit is given an operational inspection, and the pumping unit is checked for output.

Having passed the inspection station, the unit is ready for cleaning and painting. Here it is cleaned, primed and painted with a customer's distinctive colors, and another all-welded concrete mixer is ready to do its job at any construction project, anywhere in the world.



HUNDREDS of 1-in. plug welds have been completed by this weldor using Mig unit with CO_2 shield. Manual arc and submerged-arc were ruled too costly for this application.

Plug welding with CO_2 Mig

FABRICATION of a steam-jacketed stainless vessel requiring a few hundred plug welds means *work*. Simultaneous scheduling of several vessels—that's *trouble!*

Chicago Steel Tank Co., a division of U. S. Industries, Inc., faced this situation and found manual arc welding too costly for the job. High labor costs prohibited its use on this particular application.

No Submerged-Arc

Other welding processes tried and found wanting by Chicago Steel Tank were automatic submerged-arc and Mig (metal inert-gas). The former method did the job well, but the costly elements of fit-up and positioning eliminated it from further consideration.

Mig welding, with such gas shields as argon and helium, lacked good penetration when test sections were etched for examination. The process had to be bypassed—but only for a short time.

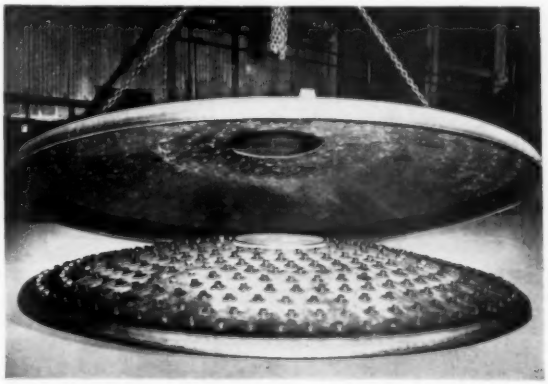
Hobart Brothers Co. and Liquid Carbonic Corp. were working with Chicago Steel Tank in an effort to find the right process for the exacting job which lay ahead. It was through numerous experiments by these suppliers that Mig was given another chance, this time with carbon dioxide as a shielding gas.

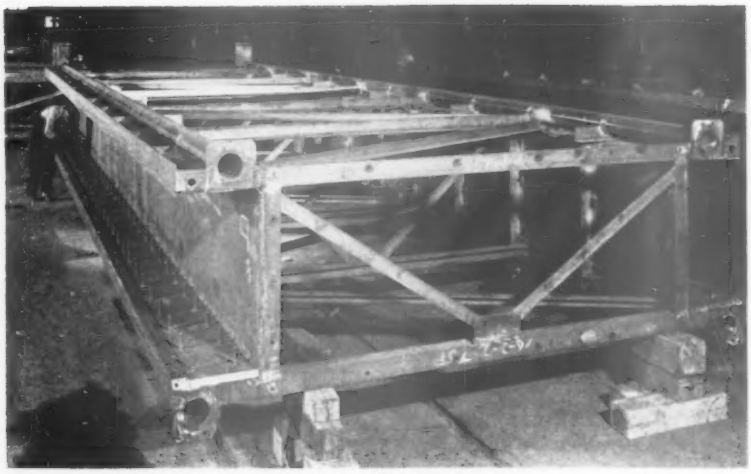
Good Penetration

The decision was the right one. CO_2 Mig gave the fabricator a high degree of plug welding efficiency. Improved penetration, greater arc control, fewer instances of improper welds needing rework, and a better weld appearance were other factors immediately evident.

The manual Mig guns making thousands of 1-in. plug welds around stay bolts projecting through cover plates were powered by a constant-voltage m-g unit. Arc voltage was approximately 42 volts, 400 amp. Wire-feed speed was 500 in. per minute and CO_2 was fed at 35 cu ft per hour.

PHOTO at left shows excellent bead obtained with CO_2 Mig; penetration also was improved through use of this gas. In photo at right, amount of work that had to be done can be estimated. Bolts create space between plates for steam circulation.





WELDOR works on 30-ft section of vertical tower which will be installed at Massena intake of Barnhart Island station. Stud welding was specified for speed, strength of weld joint, and ease of rail installation.

Stud welds are vital to St. Lawrence power

WELDED STUDS will fulfill key functions in the power generation set-up along the St. Lawrence Seaway.

They are being used at the Massena (N.Y.) intake of Barnhart Island power station in an application demanding strength and close tolerances.

Huge vertical towers—some as high as 104 ft—will hold gates which can be raised or lowered to control water flow past turbogenerators. Towers are being fabricated by Alco Products, Inc., at Dunkirk, N.Y.

Almost 20,000 flux-filled studs, the bulk made from type 304 stainless steel rod stock, were welded to gate channels on both sides of the towers. They will secure rails on which gates will slide.

Inboard Side

Standard rail clips slip over studs along with shims and base plates, then fit over rail flanges. Studs were provided by Nelson Stud Welding Div., Gregory Industries, Inc., Lorain, Ohio.

On the inboard side of gate channels, where water pressure will be greatest, 7/8-in.-diameter studs, 3¼ in. long, were welded in two rows on 12-in. centers. These studs will secure rails weighing 175 lb per yard.

On the outboard side of channels, 5/8-in.-diameter studs, 1¼ in. long, were welded on 12-in. centers. These studs will secure smaller rails weighing 40 lb per yard.

Rail Alignment

Speed of stud welding is an important factor in meeting tight delivery requirements on towers. In addition, time is being saved at the job site because rail installation and other fastening elements need only be handled from one side.

Although no alternative fastening method was considered, welded studs were specified for several reasons by those who designed the Barnhart Island power plant for the New York State Power Authority.

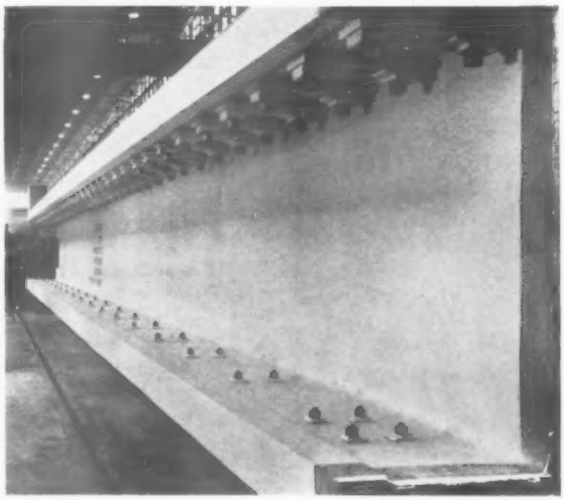
(1) Studs reportedly could be welded to tower frames more quickly, easily and economically than other fastening devices which could have been used.

(2) Studs could meet close tolerances (about 1/16 in.) needed for rail alignment.

(3) Weld joint strength would assure dependable, trouble-free rail fastening.

(4) Stainless steel studs, used in those tower areas which will be in direct contact with water, should reduce corrosion problems and facilitate future track replacement or realignment.

(5) End-welded studs would elimi-



STANDARD rail clips on welded studs will hold rails on which gates slide. Stainless studs are said to minimize corrosion and facilitate future rail replacement or realignment.

nate drilling, tapping or punching to accommodate bolts requiring nuts at both ends that could work loose in the future.

Fiber Templates

Since strength of the mild (A-7) hot-rolled steel in gate channels is less than that of the stainless stud, engineers worked out a unique approach to develop full stud strength.

Small stainless steel *buttons* were hand-welded to stud locations. This procedure spreads loading over a wider area and provides a balance between stud and plate strengths. Results are reportedly satisfactory from every point of view.

Fiber templates were used both for chalk-marking button areas and for locating the stud welding gun precisely.

The Massena intake will have twelve towers, each with three large sections measuring approximately 30 ft high. In addition, approximately 476 smaller sections of varying lengths are being fabricated.

With gates open, the American portion of Barnhart Island power station will develop 940,000 kw. The Canadian half will develop a similar amount.

BARNHART Island power station will develop 1,825,000 kw of electricity when St. Lawrence Power Project is completed in 1958. Station is joint undertaking of U.S. and Canada.

Working details of this electrical set-up

THE St. Lawrence Power Project, when disassociated from the companion $281,000,000 Seaway work, consists of four major installations—Barnhart Island power station, Massena intake, Long Sault Dam and Iroquois Control Dam.

Extensive channel work, dike construction and wing dam facilities are tied in with the power project. When put together into a final 1,825,000-kw generating facility, one entire town will be in two new locations, main highways will have been relocated, railroads will run through new sections and farms will be inundated.

Miles of welding will be used on steel fabrications for these and other installations. Alco Products alone is welding more than $5,000,000 worth of project components at plants in Dunkirk and Auburn, N.Y.

Best-Gate Capacity

(1) Barnhart Island power station is a joint undertaking of the United States and Canada since the international boundary will split the plant in half. Its total best-gate generating capacity will be 2.2 million hp and 1.825 million kw.

The power dam will consist of a huge concrete intake structure and the powerhouse itself, which is integrated with the dam. The entire structure will form a concrete dam about 3,230 ft long spanning the river channel in a straight line.

The power station will generate at 13,000 volts, with step-up transformers to attain efficient voltage for long-distance transmission.

(2) Massena intake will control water flow into the existing power canal leading to a low-head power plant at Massena, N.Y. When the power project is completed, this plant will be abandoned.

(3) By closing off the south river channel near the head of Barnhart Island, Long Sault Dam will provide close regulation of the forebay water surface elevation for Barnhart power station. The dam also will discharge any water flow not destined for the station.

Long Sault will rise 145 ft above its foundations, and will raise the water level about 90 ft.

(4) Iroquois Dam, a short distance down the St. Lawrence from Ogdensburg, N.Y., will replace a natural rock weir to control outflow from Lake Ontario with greater flexibility.

Seaway Project

No account of the development of the St. Lawrence area for its power potential would be complete without mentioning the Seaway Project undertaken simultaneously by the United States and Canada.

This work actually extends from Montreal to the Welland Canal connecting Lake Ontario and Lake Erie—and the navigational tie-in reaches to Sault Ste. Marie, Minn.

Major Seaway work by the United States is the Long Sault Canal, which will carry ocean-going vessels bound for the Great Lakes and return around the Long Sault Dam. This $81,000,000 project will include two locks and a canal about 8 miles long.

The Seaway will open the Great Lakes to ore-carrying vessels from Labrador, as well as general cargo ships plying sea lanes between Europe and the U.S.

In this, the ninth article of the popular series which began in Welding Engineer *back in March, 1955, author Barnett discusses the composition and uses of high-tensile and low-alloy electrodes.*

Filler metals for joining

By Orville T. Barnett*

A DETAILED, over-all view of all high-tensile and low-alloy electrodes available in today's market could be a bewildering experience.

At first glance, chemical compositions suggest a witch's brew in which alloys have been distributed by imaginative caprice. Luckily, a brief review of high-tensile welding history can be coupled with broad areas of application requirements. In this manner, blurred outlines can be brought into needle-sharp focus.

The guide to ruling factors found in the appendix to the AWS-ASTM specification for low-alloy arc-welding electrodes offers a good starting point. Here, the transition from specified mechanical properties to a combined specification of mechanical properties and chemical composition is explained. Only the most popular of hundreds of available types are included.

Tensile Strengths

Five strength levels are described in terms of minimum tensile strength for stress-relieved, all-weld-metal specimens. These values, along with yield strength and ductility, are reported in condensed form in Table I.

Tensile strengths climb by 10,000-psi steps to 100,000 psi, then take a double step to 120,000 psi. In the first four groups there is one ductility maverick for each. The E7020 electrodes are expected to have slightly greater ductility; E8013, 9013 and 10013 types display less ductility. In actual practice, these variations have little real significance.

All normal coating varieties described earlier in this series (WELDING ENGINEER, *Mar., 1955, p. 40)* show up once again.

The EXX20 coating is found in the 70XX group only. The EXX13 formulation appears through the 80XX, 90XX and 100XX groups. Finally, the two cousins, EXX15 and XX16, are the remaining survivors in the 120XX classification.

With improvement of EXX15 and XX16 coatings, and the growing skill of weldors who use these electrodes, all groups above 70XX may be expected to shrink to the low-hydrogen categories alone.

Weld Deposits

Historically, E7010 electrodes were first upon the high-strength welding scene. Pressure vessels of silicon-killed high-strength steels possessed a tensile strength above 70,000 psi.

Therefore, electrode designers added molybdenum to the coating of their 6010 electrodes until weld deposit revealed from 0.40 to 0.60% molybdenum. Now weld deposit matched strength but not chemistry of base metal.

—*Courtesy A. M. Byers Co.*

PIPELINE applications excepted, E7016 low-hydrogen, iron-powder electrodes are rapidly displacing 7010 and 7011's. Reasons for this widespread switch are said to be the former's greater speed, higher quality and almost complete freedom from underbead cracking.

To this day, metallurgical engineers reluctantly accept the fact that it is impossible to match physical properties in high-tensile, low-alloy base and weld metals which have equivalent chemistry.

Generally, weld metal is lower than base metal in carbon manganese and some alloying elements to achieve equal strength. Where chemistries of major alloying elements are matched, as in carbon-molybdenum, chrome-moly and nickel steels, carbon and manganese are kept lower in the weld deposit.

When molybdenum was added to E6010 coatings, weldors reported an improvement in handling characteristics. Today, E7010 electrodes are employed for pipelines, piping, pressure vessels and low-alloy proprietary

*Assistant manager, Metals Dept., Armour Research Foundation of the Illinois Institute of Technology, Chicago.

TABLE I—Minimum tensile strength and ductility requirements for stress-relieved all-weld-metal tension test specimens

AWS-ASTM classification No.	Tensile strength (min., psi)	Yield point (min., psi)	Elongation in 2 in. (min., %)
E7010, 7011, 7015, 7016	70,000	57,000	22
E7020	70,000	57,000	25
E8010, 8011, 8015, 8016	80,000	67,000	19
E8013	80,000	67,000	16
E9010, 9011, 9015, 9016	90,000	77,000	17
E9013	90,000	77,000	14
E10010, 10011, 10015, 10016	100,000	87,000	16
E10013	100,000	87,000	13
E12015, 12016	120,000	107,000	14

construction steels. Because the E7011 electrode is simply the a-c counterpart of a 7010, no detailed discussion of this type is necessary.

Pressure Vessels

Rapidly displacing 7010 and 7011 electrodes in every application except piplines is the E7016 type . . . a low-hydrogen, iron-powder product. Reasons for the change are the latter's greater speed, higher quality (even though the specification doesn't show it) and almost complete freedom from underbead cracking.

The E7015 electrode is virtually extinct. However, higher strength EXX15 electrodes are thriving. Types 6015, 6016 and 7015 have largely given way to E7016. Greater strength is no handicap because ductility and low-temperature impact properties of 7016 grades are excellent.

Some manufacturers make several types of E7016 electrodes. These vary by chemistry and are intended for either general high-strength applications or for matching base metal chemistry of a type encountered in chrome-moly power piping and pressure vessels.

Four electrodes of the E7016 group exhibit typical mechanical properties and deposit chemistries listed in Table II.

Low-hydrogen lime-base coatings offer electrode designers great latitude in carbon, manganese and alloy additions.

Submerged-Arc Welding

For over twenty years E7020 electrodes were of carbon-molybdenum or 2% nickel varieties. Now carbon-molybdenum analysis persists while the nickel-alloy type has been superseded by low-hydrogen varieties. Because low-hydrogen lime-base coatings will tolerate more alloy content, both the 2% and 3% nickel analyses are usable.

The old-style E7020's had an exasperating tendency to crack in the weld deposit when nickel exceeded 2.25%. As automatic submerged-arc welding continues its persistent replacement of manual welding in the pressure vessel field, complete elimination of E7020 electrodes becomes only a matter of time.

Although the AWS-ASTM specification doesn't report it, carbon-moly electrodes in the 7020 classification may contain vanadium up to 0.15% maximum. Without vanadium, 7/32 in. and larger diameters often fall short of the required 70,000-psi minimum tensile strength.

Carbon-moly electrodes are declining as power piping and pressure vessel manufacturers shift from molybdenum to chrome-moly base metals. The latter do not suffer embrittling effects of graphitization.

Nickel-steel electrodes match base metals where 3% nickel is chosen for its low-temperature impact advantages on pressure vessels used in frigid climates, or for sub-zero processing conditions down to —175 F.

Sound Scientific Data

When the AWS-ASTM specification is revised, carbon-manganese steels which also contain a small amount of molybdenum may prove a logical addition to the list specifying chemical composition.

Preheating, maintenance of high interpass temperatures and stress-relieving are often based upon mumbo-jumbo instead of sound scientific data. A thorough understanding of the excellent text on *Weldability of Steels* (Stout and Doty) is a basic requirement for anyone welding low-alloy steels.

Table III presents an abbreviated approach from the AWS-ASTM specification. This philosophy suggests that steels normally welded with E70XX or any low-hydrogen electrode will be preheated and stress-relieved at relatively low temperatures. This table is intended only to produce crack-free weld deposits of acceptable ductility, and does not suggest base metal treatments.

Higher strength EXX10, XX11 and

TABLE II—Typical stress-relieved mechanical properties and chemical analyses of deposited weld metal for commercial E7016 electrodes

Electrode:	*A*	*B*	*C*	*D*
Ultimate tensile strength (psi)	73,000	73,000	75,000	75,200
Yield strength (psi)	61,000	61,500	45,000	66,100
Elongation (% in 2 in.)	36.0	31.0	27.0	34.0
Reduction of area (%)	70.0	63.0	41.0	—
Carbon (%)	0.07	0.10	0.23	0.08
Manganese (%)	0.82	0.80	0.76	0.77
Silicon (%)	0.47	0.41	0.43	0.20
Chromium (%)	—	0.50	—	—
Nickel (%)	—	—	—	0.96
Molybdenum (%)	—	0.50	—	—

Electrodes A and D are for all-around low-hydrogen applications. Electrode B was designed for specific power piping and pressure vessel chemistry requirements. Electrode C was developed for casting repairs where a higher carbon deposit is sometimes desired.

XX13 electrodes need hotter preheat and interpass temperatures to reach recommended ductility levels. In addition, base metals with which they are used need preheat and interpass temperature treatments to avoid cracking the heat-affected zone.

Finally, all high chrome-moly EXXXX-B3 *(2¼% chrome—1% moly)* electrodes need high preheat and interpass temperature control followed by high-temperature stress relief *(1,350 F is specified)*.

Low-Hydrogen Electrodes

Recent tests have shown that 2.25% Cr—1.0% Mo piping can be welded without preheat under conditions of no restraint, or without interpass temperature control, after a sound root pass has been deposited. If 1.25% Cr—0.5% Mo electrodes are applied to the more highly alloyed base metal, it should be possible to eliminate both preheat and postheat.

Most alloy steel welding in the 80,000-psi tensile strength level and beyond is tending toward exclusive use of low-hydrogen electrode types.

Here is the present status for all coating types. The EXX10, XX11 and XX13 types have been used for chrome-moly base metals in 80XX through 100XX strength levels. However, improved EXX15 and XX16 electrodes are first choice among many users of these steels. Railroad castings and pressure vessels are welded with E8016-C1 *(2¼% nickel —0.90% manganese)* electrodes.

One holdover from World War II is the manganese-moly electrode of E9015 or 9016 classification. Table IV reports typical mechanical properties and chemistry of weld deposit.

TABLE IV—Typical stress-relieved mechanical properties of E9016 manganese- molybdenum electrodes

Ultimate tensile strength (psi)	92,000
Yield strength (psi)	80,000
Elongation (% in 2 in.)	26.0
Reduction of area (%)	47.0
Carbon (%)	0.12
Manganese (%)	1.75
Silicon (%)	0.35
Molybdenum (%)	0.35

TABLE III—Preheat, interpass and stress-relief temperatures (F)

AWS-ASTM classification No.	Preheat and interpass temperatures	Stress-relief temperature
E70XX	200-225	1150±25
EXX15		
EXX16		
EXX10	325-375	1150±25
EXX11		
EXX13		
(except 70XX)		
EXXXX-B3	325-375	1350±25

This electrode was originally developed to weld armor plate less than 1½ in. thick. Critically short chromium and nickel were not consumed by this type. Today it is used for abrasion-resisting and high-strength steels, re-rolled rail steels and other high-strength materials.

Tempered Steels

High-strength steel casings have been welded with E10010's for oil field applications. The E10013 type has found favor in the aircraft industry for fuselages, landing gear supports, engine mounts and the like. In aircraft work, alloying of weld metal by base metal yields high-strength, heat-treated joints.

No discussion of filler metals for low-alloy, high-strength steels would be complete without recognizing new quenched and tempered steels, such as T-1.

They are being used in increasingly large tonnages for earth-moving equipment, for pressure vessels, and for structural steel weldments.

Where T-1 steel weldments are used in an as-welded condition, E12015 electrodes will develop full base metal strength. If weldments must be stress-relieved to meet a specification requirement, transition temperature of stress-relieved E12015 is undesirably high for preferred low-temperature impact properties.

For this reason, tensile strength is sacrificed for improved low-temperature impact values by using E9015's for T-1 weldments subject to stress relieving treatments.

Better Filler Metals

In higher-strength, low-alloy electrodes above E70XX, both XX15 and XX16 designs are encountered. Some fabricators feel that the XX15 type's higher lime content may give them some ductility advantages. Also, d-c is somewhat more common in field welding high-strength materials.

The postwar period has witnessed rapid growth in better filler metals for welding high-strength low-alloy steels. As strengths increase, fabricators need more precise control of welding variables.

With each passing year, electrode designers have improved their products making these exacting welds easier for the weldor to make, and of better quality for fabricator and user alike.

Foremost among achievements of low-alloy, high-strength electrodes with lime-base, low-hydrogen coatings are the following:

(1) Improved impact properties at normal temperatures, and a substantially lowered transition temperature.

(2) Much better ductility at high-strength levels.

(3) X-ray soundness.

(4) As-welded properties that frequently eliminate need for stress-relieving.

(5) Lowered alloy loss through the arc because of a deep protective crucible formed on the electrode, and because of recommended shortened-arc welding techniques.

(6) Freedom from cracking in the *blue-brittle* range.

(7) Enamelling quality without prior hydrogen-removing heat treatments.

(8) Faster welding because of higher currents.

(9) Good weldability on high-sulphur hardenable steels.

(10) Interchangeability with stainless electrodes in maintenance applications.

This reader finds that . . .

Iron-powder 6024's are no panacea

WITH MUCH interest, I have followed the various reports on *Filler metals for joining* prepared by Orville T. Barnett for WELDING ENGINEER.

The author has done an excellent job in his technical and practical presentations. However, concerning the eighth article in this series *(December, 1956 p. 54)*, I wish to comment not so much on what Mr. Barnett has stated, but on what he has not mentioned.

He states in opening remarks that iron-powder electrodes "burst upon the welding scene." This is putting it mildly. Many were led to believe, and forced to assume by popular demand, that here was a cure-all.

A feeling of wide-spread acceptance was created. Some even believed this new electrode would replace semiautomatic and, to some extent, fully automatic applications.

Amidst excitement and confusion, some manufacturers tried to cash in on the "we had it first" sales argument. In fact, no less than three manufacturers' representatives informed me that they were originators of, or the first to produce, low-hydrogen, iron-powder electrodes.

Not a Peep

Descriptions of the new type sound like a sales pitch on a new auto model. Speed and more speed—but not a peep about undercut, underbead porosity, weld metal dilution and critical amperage ranges.

If a welding engineer who tests and compares E6024 and 6012 types on production applications is a bit sleepy, he may be rudely awakened. This is particularly true if he has not considered fit-up, joint accessibility and continuity.

International Steel, in Evansville, Ind., is basically a structural job shop, ranking eighth in the nation. It tools and schedules production applications in fabrication of rail car components and other items.

Time and experience has taught this firm that, without careful analysis of production applications, value derived from use of the iron-powder type may be lost down the drain.

We have found through experience that, under certain conditions, fillet welding of heavier A-7 steels prohibits use of 6024 electrodes; little or no difficulty, however, has been encountered with conventional electrodes. On thick-section groove welds, it is necessary to deposit root passes with E6010-11, 6016 or 7016 electrodes, then finish with E6024 or 6027.

30-Amp Range

According to a test report on all-welded metal specimens by a large Pacific Coast company, iron-powder electrodes in the E6027 class were *not suitable for single-pass groove welds.* All testing was done under normal shop conditions, using production-line techniques.

Another leading firm in the East, which normally uses over a million pounds of electrodes a year, has established a 30-amp range when using iron-powder electrodes with a-c. This is significant in view of the number of welding machines that will not register or indicate approximate required amperages at the electrode holder. Other methods, then, must be adopted to insure weld quality.

Experienced weldors usually can judge performance of their machine and of conventional electrodes (with which a wide amperage range is acceptable). The same analysis is difficult to establish with iron-powder electrodes and, to complicate matters, amperage range is much more critical.

Improvements in speed and deposition rates with the iron-powder electrode would seem to substantiate its superiority over a conventional counterpart—notwithstanding cost differences and the use of smaller diameters. But you cannot dispute time-study facts.

When arc time is a small percentage of total weldment time, iron-powder electrodes offer little or no advantage except surface appearance. This can be a villain in disguise to both weldor and inspector.

The tendency in production operations to condone wasted weld metal only means added cost. It is impractical to make multiple-pass horizontal fillets with an E6024.

With increased currents and speeds, we have found a fine line or undercut on horizontal fillets. Electrodes manufactured by five different firms were tried; no appreciable differences were noted. On commonly welded material this should not be too objectionable, but customers' inspectors would not accept it.

Through modifications, the all-position, low-hydrogen iron-powder electrode *(no AWS designation yet*—Edit.) is in the enviable position of being the most logical answer to inconsistencies encountered with E6024 and 6027 types. *This electrode is here to stay.*

Harold Hicks
International Steel Co.

The author replies . . .

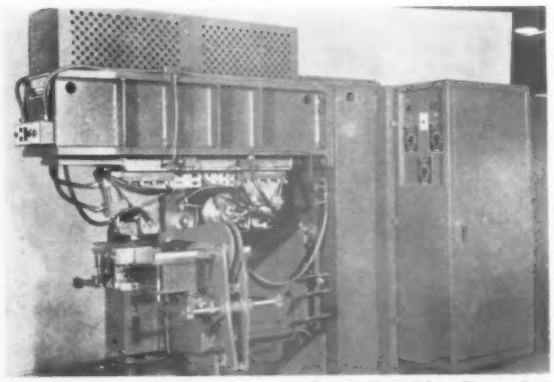
WE APPRECIATE the contribution Mr. Hicks has made in commenting on the article in the December, 1956, issue of WELDING ENGINEER.

New electrode types, almost without exception, need coating design revisions after early field applications. Users dictate performance, mechanical property and soundness criteria. Constant improvement also springs from keen competition among producers.

Iron-powder electrodes stormed into the market. Many early types weren't as good as advertising managers were told they were. Today, however, improved types represent over 10% of all electrodes sold.

We want to thank Mr. Hicks for his thoughtful remarks. He obviously has studied the iron-powder electrode picture carefully. His words remind us that there are no panaceas in welding.

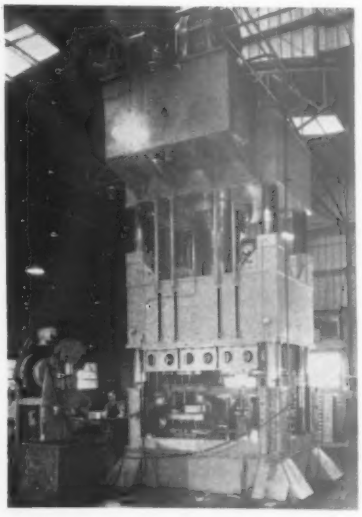
Orville T. Barnett
Armour Research Foundation



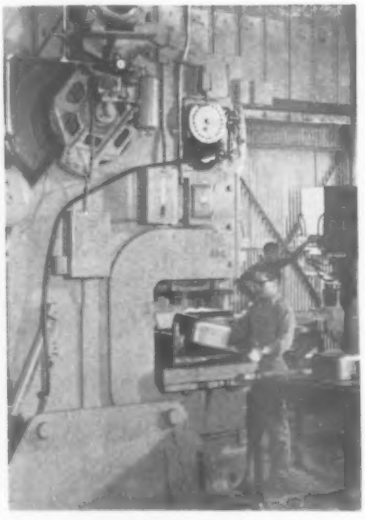
Courtesy Sciaky Bros., Inc.

SINGLE-PHASE 250-kva mash welder, served by roller conveyor line, is capable of producing 110 double sinks per 50-minute hour. Each unit requires 25 in. of mash welding.

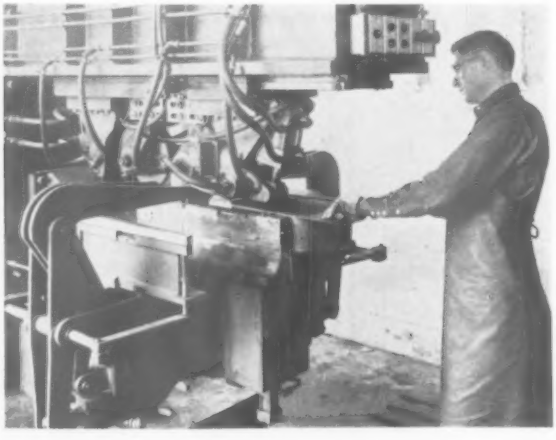
Mash welder cuts waste in joining sinks



HYDRAULIC press deep-draws 14-gage stock a total of 7⅜ in. to form each sink unit. Press produces 500 units per 8-hour day (50-minute hours).



UPON completion of drawing, shearing and punching, units are conveyed to 150-ton press where center drain hole is pierced and embossed.



UNSKILLED operator loads parts for joining, actuates welder, and unloads to pass complete double sink for finishing.

A SINGLE-PHASE mash welder, served by roller conveyor lines, is capable of producing 110 double sinks per 50-minute-hour at Southern Porcelain Co., Dallas, Tex.

The welder, which began joining deep-drawn steel double sinks under the guidance of an inexperienced operator, set a record when it completed 10,000 sink units with less than a 1% scrap factor. Each double sink requires 25 in. of welding.

Before the mash welder was used, Southern Porcelain tried unsuccessfully to join two 14-gage, deep-drawn sink units by every conceivable method. Since porcelain finishing demanded strong, smooth, non-porous joints, rejections ran high.

Hydraulic Press

Quality and production rate resulting from use of the new machine were beyond the Dallas firm's expectations. In addition, complicated, expensive metal-finishing operations were almost entirely eliminated.

A 1,000-ton hydraulic press deep-draws 14-gage stock a total of 7⅜ in. to form each sink unit. This press produces 500 units per 8-hour day (at 50 minutes per hour).

After drawing, a punch press adjacent to the 1,000-ton press shears the edge to be joined and punches two locating holes for welding alignment.

Clamping Device

When drawing, shearing and punching are completed, units are conveyed to a 150-ton press where the center drain hole is pierced and embossed.

WELDER joined 10,000 units with less than 1% scrap factor.

Because units are welded with flood-water cooling, the operator once had to invert them after joining to empty accumulated water. However, piercing the center drain hole prior to welding has eliminated this extra, unnecessary step.

In joining the two units, an unskilled operator loads them, actuates the welder, and unloads to pass the completed double sink for finishing. Two welding wheels are used to limit head travel to only half of the entire joint. A simple, automatic parts clamping device is used.

Designed for external cooling, the mash welder has a 25-in. longitudinal throat depth. Its welding stroke is 1½ in., with no retraction stroke.

Automatic Washing

The 440-volt, 60-cycle machine is rated at 250 kva with a 50% duty cycle. Squeeze time is 1.2 seconds; hold time, 1.2 seconds, and weld time, 1 and 2 seconds.

Hand grinding following mash welding is limited to just one pass. This is the only metal-finishing operation required to prepare the welded joint for porcelain treatment. Therefore, finishing costs are cut.

After simple grinding, the double-sinks are washed automatically and conveyed to the press line for a restrike, contour of edges, and piercing for fixtures and trim. Finally, brace and hargar tabs are mounted and units are porcelain-coated.

Although the mash welder has provisions for phase shift and transformer water cooling for heat control, there is no tap switch.

Mash welding: what is it?

MASH welding differs from other forms of resistance welding: it resembles seam welding in method and flash-butt welding in result.

It is used to join edges of two sheets of metal (generally of the same thickness), producing a flush surface requiring a minimum of finishing.

After completion of the weld, both sheets lie in the same plane, with the weld area only slightly thicker than the sheet.

In mash welding, edges of sheets to be joined are overlapped as in seam welding. It is different from the latter technique in that amount of overlap approximates thickness of the material.

Flat-faced wheels of the seam welder type are passed over lapped edges in mash welding. Welding current is passed either continuously or in a series of closely-spaced impulses as in seam welding.

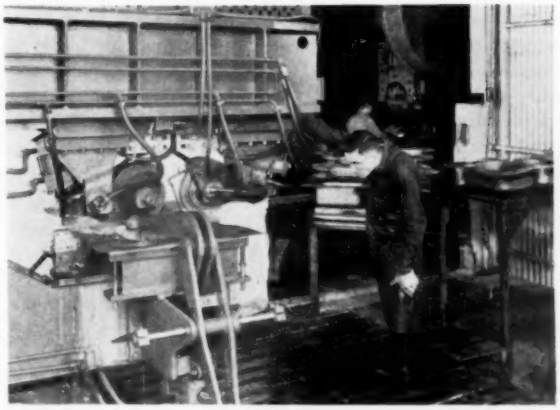
Size and thickness of mash welds are determined largely by amount of overlap. In contrast, size of the weld and its location in seam welding are determined largely by size and contour of wheel faces.

Overlap required for mash welding is small, but the same amount must be maintained exactly over the entire weld length. As welding wheels mash the joint, parts tend to spread apart. The thicker the material, the greater this tendency to spread.

Therefore, the primary difference reflected in mash welding equipment as compared to that for a seam welder is the need for a parts clamping device.

A mash weld can be made satisfactorily with either a projection welder or a spot welder. One impulse of welding current will suffice if overlap is small.

In this instance, long flat electrodes are used. However, special tooling must be used to clamp parts.



THIS view of mash welding operation shows welder completing joint. Operator unloads welded units to conveyor at his back, and loads from conveyor to his right.

HAND grinding following mash welding is limited to one pass. This is only metal-finishing operation required to prepare welded joint for porcelain treatment.

FLAT-platform truck bodies are made by fixing 6 by 2-in. channels longitudinally to truck's steel chassis. Aluminum I-beams are then welded to longitudinal beams.

Mig process is used to weld aluminum vehicles "down under"

By A. E. Wilson
Technical Sales Manager
Commonwealth Industrial Gases, Ltd.
New South Wales, Australia

MANY AUSTRALIAN industries are taking advantage of the new ease with which aluminum alloys, stainless steel, copper and bronze may now be joined with Mig.

Brewers, for instance, brew beer in vats fabricated by the Mig method; chemical firms use large storage tanks welded by the process, and window-frame makers are turning out one-piece, lightweight frames in the same way.

Although these are random examples of Australia's rapidly expanding use of this process, Alemco, a new Brisbane firm, is perhaps unique in that it has built a flourishing engineering business within the space of only four years—almost entirely with the aid of Mig welding.

Lower Tax Rate

The firm has chosen to specialize in welded bodywork for transport vehicles. Transporting goods by road is popular in Australia even though it often involves hauling heavy payloads over distances up to 2,000 miles.

Vehicle tax, which is assessed on a tare-weight basis, is high. Besides allowing bigger payloads, vehicles made of light alloys offer an added saving in that they incur a lower tax rate. Therefore, there is a hungry market for vehicles of this type.

Although the initial cost of aluminum bodywork is higher than that of steel, the Mig process offsets this cost to some degree by providing a means of fabrication which, though cheap, is of high quality. The increased payload quickly overtakes, and eventually shows a profit on, the initial extra outlay.

Until recently, the limited amount of aluminum bodywork done in Brisbane was used mainly for trucks of riveted construction for short-range coal hauling.

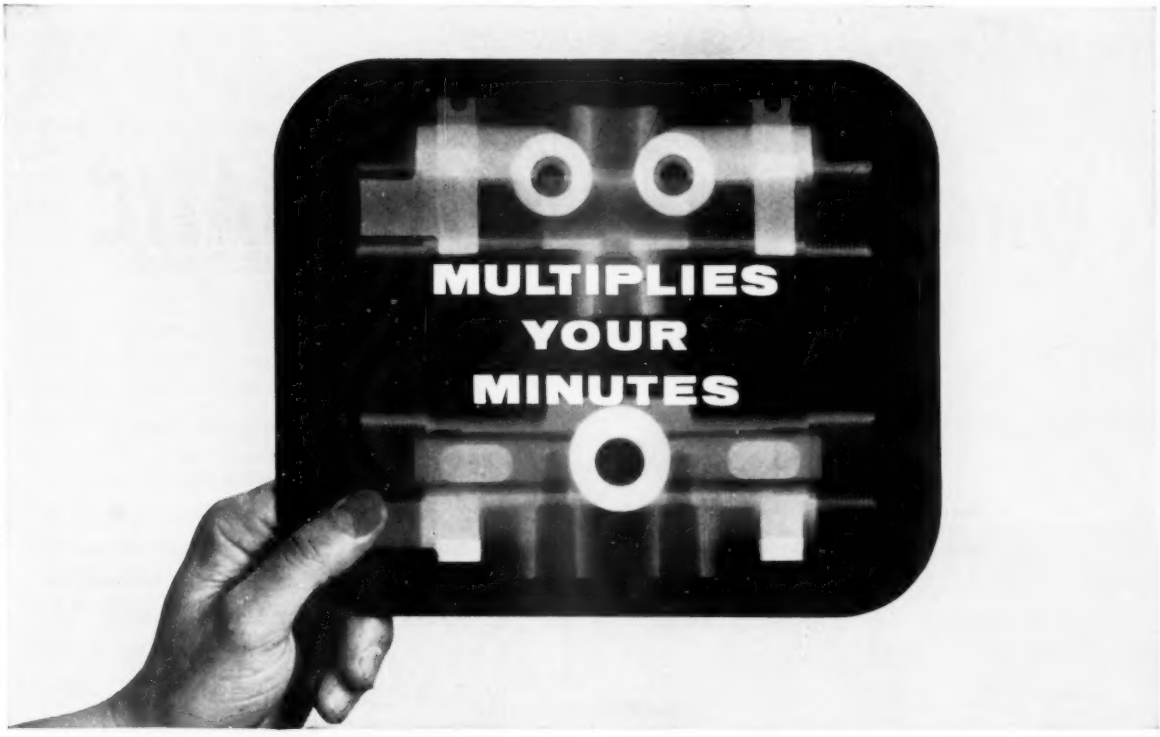
However, Alemco is already doing things in a bigger way—among other things, it turns out 32-ft-long, 15-ton capacity semi-trailers entirely of welded aluminum. Argon provides the gas shield for the Mig welding process.

MINE skip is another example of welded aluminum construction. Simple and functional in form, this skip has capacity of 1 ton.

Transverse Channels

Construction material used is primarily a heat-treated, aluminum-magnesium-silicide alloy which demands careful design in relation to welding. Heat-treated parts (overaged because of welding) should not be subjected to extremely high fiber stresses.

Transverse channels—4 by 2 in.—are placed into the web of the main 6 by 3-in. longitudinal channels and welded around the joint. Welds are positioned as close as possible to the



New Kodak Industrial X-ray Film, Type AA

When you're faced with the need for quantities of high-quality work, Kodak's new Industrial X-ray Film can be an outstanding find.

Because of its greatly increased speed, exposure times can be cut, and more production realized with existing x-ray equipment and gamma ray sources.

While this new film ranges up to more than twice as fast, it still has the fine sensitivity characteristics which made Kodak Type A the most widely used x-ray film in industry.

Kodak Industrial X-ray Film, Type AA, extends the service of present radiographic equipment, saves time, produces quality results. Have your x-ray dealer or Kodak Technical Representative show you how.

EASTMAN KODAK COMPANY
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Read what the new Kodak Industrial X-ray Film, Type AA, does for you:

- Reduces exposure time—speeds up routine examinations.
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- Reduces the possibility of pressure desensitization under the usual shop conditions of use.

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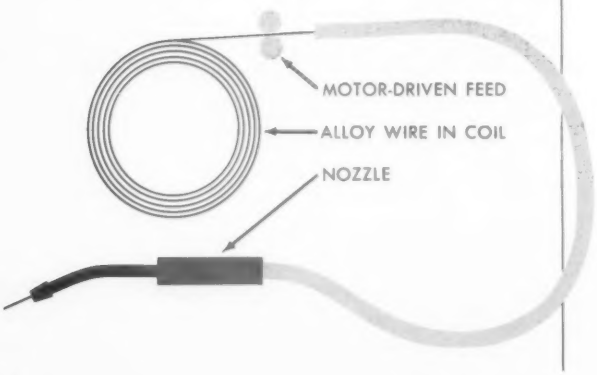
WHAT IS *SEMI-AUTOMATIC* HARD-FACING?

Here is one of industry's newest maintenance tools used to radically reduce hard-facing costs. It is simple, highly versatile and can be installed at moderate price.



Semi-automatic hard-facing is a process which combines the high deposit rates of automatic welding with the positioning and setup convenience of the manual method. It utilizes a complete series of Stoody fabricated tubular wires containing alloys that meet all hard-facing requirements. These wires, supplied in layer wound coils, are mechanically fed to the nozzle by the semi-automatic welding machine. The weldor merely directs the arc as the metal is deposited on the work, the machine automatically starting the wire feed when the arc is struck, stopping it when the arc is broken. Numerous advantages result when rebuilding and maintaining equipment in all types of heavy industry.

Repointer welded on with Stoody Nickel Manganese and entire tooth hard-faced with Stoody 121

Roll brought up to size with Stoody Nickel Manganese and corrugations rebuilt with Stoody 100

HIGH WELDING SPEEDS—Two to four times faster than the manual method at correct welding amperages, semi-automatic hard-facing effects enormous savings in time. Penetration of the base metal and dilution of the deposit are reduced, with lower heat input, all highly desirable features of this process.

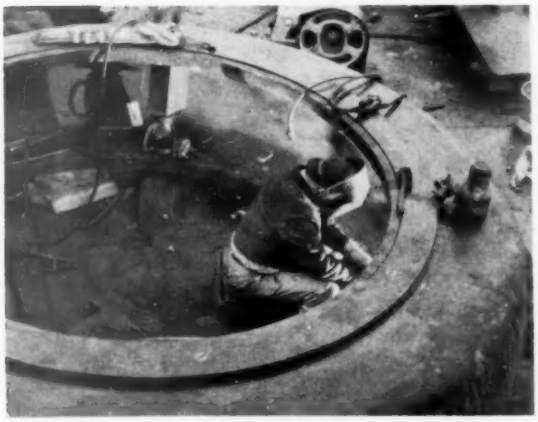
FULL VISIBILITY—No submerging flux is required; the weldor enjoys complete visibility of the weld at all times. Flux dams are unnecessary.

NO STUB END LOSSES—Wires are supplied in continuous coils. There is no stub end waste nor time lost in changing electrodes.

SEMI-AUTOMATIC MACHINES—Now supplied by a number of manufacturers, all can be used satisfactorily with Stoody semi-automatic wires with minor conversions consisting of wire guides, nozzle and nozzle tip. Conversion kits are available from all Stoody distributors.

WHERE CAN SEMI-AUTOMATIC HARD-FACING BE ECONOMICALLY USED?—In general, almost any work now hard-faced manually can be completed faster and cheaper semi-automatically with deposits having wear resistance usually superior to manual electrodes of similar analysis. The illustrations are typical of current semi-automatic applications.

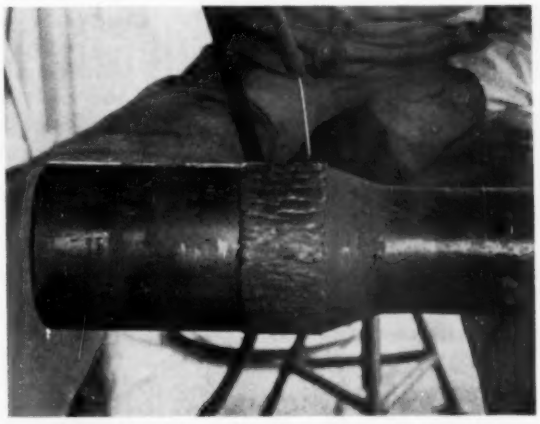
Write for circular. Contains a full description of present Stoody semi-automatic wires and typical applications.
Available from your Stoody dealer.
Check the "Yellow Pages" of your phone book or write direct.



Dredge pump casing hard-faced with a combination of Stoody 121 and Stoody 100

Shovel track pads rebuilt with Stoody Nickel Manganese

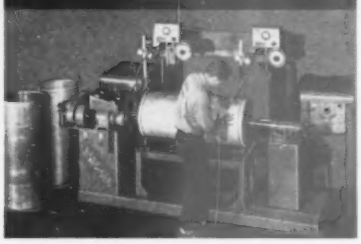
Mill hammers brought up to size with Stoody Nickel Manganese, using copper form, then hard-faced with Stoody 100



Tool joints hard-faced with Stoody 130 or Stoody 100

STOODY COMPANY
11941 EAST SLAUSON AVENUE
WHITTIER, CALIFORNIA

how to make fusion butt welding a *push-button operation*



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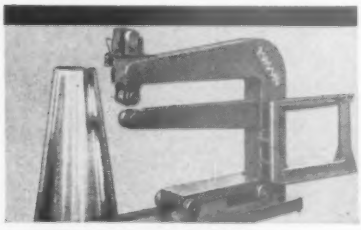
Designed for circular welding of components with automatic chucking and ejection of parts and transfer. Chuck expands internally for sizing. Surface speed to 300″ per min.

LONGITUDINAL *automatic fusion butt welding fixture*
Hold-down fingers with "toe touch" control lock parts in position for welding. Back-up mandrell with up to 6 copper inserts permits fast job changes. Handles all weldable metals .005 to 1″ thick and lengths from 2′ to 12′.



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FIXTURES & POSITIONERS
"guides the arc to the mark"

SKELETON for 32-ft-long, 15-ton capacity semi-trailer shows tension bar, staunchions and tension bar assembly.

beam's neutral axis to reduce extreme fiber stress.

Cast aluminum hangers are welded to main longitudinals to form part of the sub-frame trusses. Corrugated 0.10-in.-thick aluminum sheets are riveted to the main frame to form the vehicle decking. Welding wire used is the 5% silicon-aluminum type.

The firm subsequently extended its activities to flat-platform truck bodies. These were constructed by fixing 6 by 2-in. channels longitudinally to the truck's steel chassis with steel U-bolts. Aluminum I-beams, $2\frac{3}{4}$ by $2\frac{3}{8}$ in., are Mig welded to the longitudinal beams as transverse members.

The flooring (as in the semi-trailers) is made of a corrugated extrusion laid longitudinally and riveted to transverse members. The side and rear coaming is made from the same section. To give added strength against loading shocks, a wooden filler is used. The tray measures 8 by 23 ft.

Besides semi-trailers and flat-platform trays, the company turns out tipper trucks as part of its range of all-welded aluminum motor transport bodies.

Mine *skips* are also an example of Alemco's welded aluminum construction. Here again, aluminum's great advantage lies in its lightness, since only limited haulage-power is available in the mine in which skips are used. Aluminum channels more of this power into hauling coal and less into hauling trucks.

The skip form is simple and functional. Edges are rolled to provide easy lap welds and the whole is mounted on cast iron wheel and axle assemblies.

These units have been subjected to a very severe testing in their twelve months of service. Nonetheless, no alterations in design have been called for as a result of this test period, because skips have easily withstood the considerable impacts involved. They showed no deterioration.

The state of Queensland depends upon an Australian sugar industry's trucks to haul cut cane through vast fields. While lightness of these trucks is desirable, they must also be priced to compete with established types made of steel and timber.

Mig welding has provided a cheap and effective means of fabricating these units. Its ease of application—particularly in positioned welding—has made it an ideal tool in prototype operations.

"HEY AL - BRING THE CRANE OVER - PETE DONE IT AGAIN"

Another first to help widen the scope of welding

Opens up new standards of speed and economy in welding mild steel

Here's the first all-position class 6010 electrode ever made with an iron powder coating. X-Ray and physical properties of the new Easyarc 10 are excellent. Outstanding characteristics for all-position welding with the inherent advantages of an iron powder coating. For a free sample of the new Easyarc 10, contact your nearest Airco Office.

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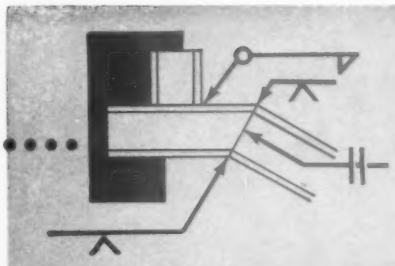


the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Thawing frozen pipes with welders

Question:

I would like some information on the use of welding machines for thawing frozen water pipes. I've read a little about this application, but my information is somewhat spotty. Could you help me?

Answer:

Thawing frozen pipes with a-c or d-c welders may require currents ranging from 100 amp for ordinary household water pipes to 800 amp for 6-in.-diameter mains. Pipes with still larger diameters and thicker walls, of course, need even higher currents.

General Electric Co. offers several suggestions concerning the role of welding machines in thawing pipes.

Thawing time usually takes about 10 or 15 minutes on small pipe and up to 2 hours on large pipe. Time depends on extent of the freeze, soil conditions and the kind of pipe. Increased current decreases the time required to thaw.

However, a short circuit through the pipe makes it possible to overload the welder severely. Therefore, it is better to take more time by using a low current than to burn up the machine by attempting to finish the job too quickly.

Thawing Current

Good connections should be maintained; poor connections may burn holes through the pipe. It is suggested that output current be set by an ammeter. In this way, the welder's continuous output rating is not exceeded.

The pipe section to be thawed should be disconnected from house piping to keep current travelling through frozen pipe only, and not through parallel paths in other piping.

Overheating of equipment, cables, connections and pipes may occur if welders are not watched carefully. The machines should never be left unattended.

Careful use of a-c or d-c welders for thawing pipe is said to possess several advantages over other methods—it reduces a fire hazard which often crops up when using other means, and it obviously saves a great deal of digging in frozen ground.

Question:

Although our firm uses threading exclusively on small pipe, I have often read of the important work welding is doing for several large fabricators—even on sizes down to ½ in. Could you give me some particular advantages of welding, as opposed to threading, small pipelines?

Answer:

There is a pronounced nationwide trend toward welding small lines from ½ in. up. The change can no doubt be attributed to cost savings, and to stronger, more trouble-free joints.

Joints of any pipe schedule are stronger when welded than threaded because the latter method cuts away as much as half of the pipe's wall thickness. Therefore, a lighter pipe schedule can often be specified for a particular service when welding is employed.

The following table, submitted by Tube Turns, Louisville, Ky., indicates that schedule 80 pipe has greater wall thickness and, therefore, more strength when joined by welding than it does after a threading operation.

Pipe size	Sched. 80 (welded)	Sched. 80 (threaded)
2½ in.	0.276 in.	0.178 in.
2	0.218	0.149
1½	0.200	0.131
1¼	0.191	0.122
1	0.179	0.110
¾	0.154	0.097
½	0.147	0.090

An installation of schedule 40 welded pipe is said to cost about 30% less than one of schedule 80 threaded pipe. In addition, maintenance overhead is lowered and flow conditions are improved.

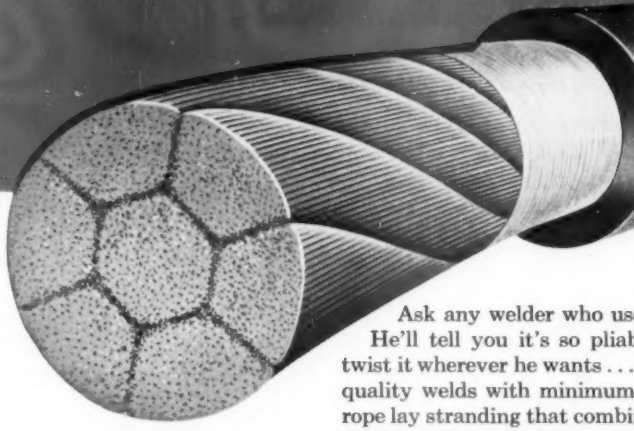
Another advantage is that labor cost is less for welding when large and medium pipe sizes are installed, and it is no greater than threading on even the smallest commercial sizes.

The following table, covering sizes from ½ through 2½ in., shows the time required to thread and tighten a joint as compared with that needed to make one weld:

Pipe size	Thread & fit	Weld
2½ in.	15 min.	10 min.
2	10	8
1½	8	7
1¼	6	6
1	5	5
¾	5	5
½	4	4

The Editors will make every effort to answer all questions submitted to this department. If you have a question concerning welding or related processes—or a tip you would like to pass along to other readers—send it to *The Welding Clinic*.

THE TOUGHEST, MOST FLEXIBLE WELDING CABLE you've ever used!



Ask any welder who uses Carol Dynapower Welding Cable. He'll tell you it's so pliable that he can bend it, coil it, and twist it wherever he wants . . . with so little effort that he makes top quality welds with minimum fatigue. The reason: Carol's special rope lay stranding that combines thousands of soft, fine wires into a flexible cable. It's plenty tough, too. Its abrasion-proof jacket of Carol rubber stands the roughest handling, and resists acids, solvents, water and oil. Available in sizes from 4/0 to No. 6 gage in rubber and Neoprene jackets.

. . . made better . . . to perform better

Like all Carol wire and cable, Dynapower Arc Welding Cable is manufactured under strict laboratory control in our complete wire-making plant. Every step, from drawing of wire to compounding of insulation, is centralized under our single responsibility. Write today for complete information to Dept. WE or see your nearby Carol distributor.

A SUBSIDIARY OF Penn-Texas CORPORATION

Carol CABLE COMPANY

DIVISION OF THE CRESCENT CO., INC., PAWTUCKET, RHODE ISLAND

Serving Industry for more than 30 years

"New Lamps for Old?"

As in Aladdin's day, you hear the cry "New Lamps for Old!"

The trade-in or rebuilding deals offered on various types of electron tubes is a current example.

AMPEREX *cannot use your old welding ignitron because*

EVERY AMPEREX TUBE IS A NEW TUBE MANUFACTURED WITH ALL-NEW PARTS AND SOLD AT THE SAME FAIR PRICE TO ANY USER, WHETHER HE HAS AN OLD IGNITRON TO TRADE IN OR NOT!

AMPEREX *ignitrons are never rebuilt tubes. Instead of "new-for-old" deals...*

AMPEREX OFFERS A QUALITY WELDING IGNITRON WITH GREATLY EXTENDED LIFE AND BACKS THIS UP WITH THE LONGEST SERVICE-PERIOD WARRANTY IN THE ELECTRONIC TUBE INDUSTRY — 2 FULL YEARS!

Remember, your real ignitron cost is your cost per hour of actual use!

AMPEREX IGNITRONS FEATURE...

- Exclusive "long-life" ignitor— promoting ease of firing
- Practical thermostatic control
- Visible glass anode seal— simplifying observation of firing
- Insulating shield around ignitor terminal
- Heavy, removable, braided, copper anode lead *(Also available in plastic coated models)*

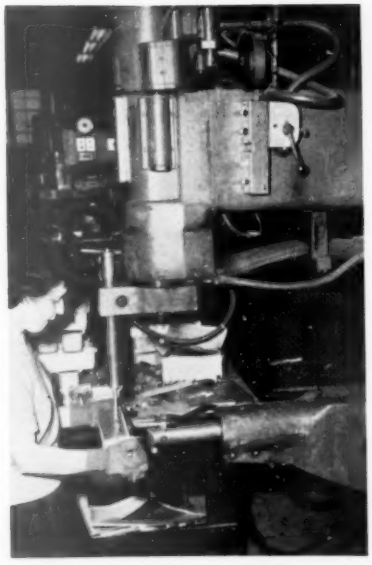
Write directly to factory for data sheets and name of your nearest AMPEREX distributor.

Amperex ELECTRONIC CORP.

230 Duffy Avenue, Hicksville, Long Island, N. Y.

In Canada: Rogers Majestic Electronics Ltd.
11-19 Brentcliffe Road, Leaside (Toronto 17)

PARTS cleaning is stressed at Spotweld. Basket containing parts to be welded is consecutively dipped in four tanks containing hot water, an alkaline solution, diluted hydrochloric acid and cold water. Small boiler in plant keeps baths at proper temperature.



REINFORCEMENT flanges of 3S aluminum are spot welded to deep-drawn alloy steel component on 75-kva, stored-energy machine. Unit is one of nine resistance welders used at Spotweld Div. plant.

Contract welding:

the little giant

By a Staff Member

INTEGRATED, highly-specialized shops combining tool and die design with production welding capacities are fast becoming more than bread-and-butter propositions.

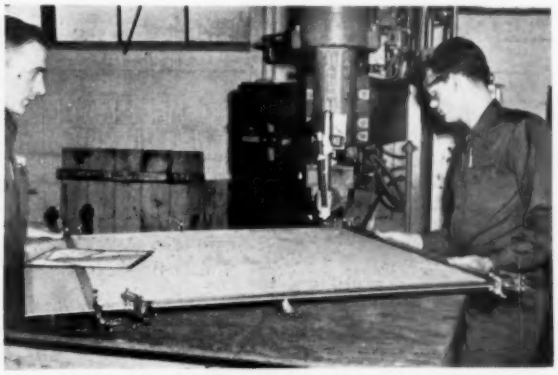
Numbered among jobbers who have been quick to spot the lucrative possibilities of government and private contract welding work is Spotweld Division of Otto Konigslow Mfg. Co.

Located on the outskirts of Cleveland, Ohio, this welding contractor began operations three years ago as an independent firm, Spotweld Co. Purchased by Konigslow, and operating as a division of that company since January, 1956, Spotweld is maintaining—and increasing—a large piece-work schedule.

Nine Welders

Modern equipment, plus elbow room, may well be the key to Spotweld's success story. Nine resistance

WELDOR joins seams on cross-ignition ducts for jet engines using Tig process. Filler metal is 1/16-in. Inconel rod. Two parts are placed side-by-side in special fixture enabling operator to make continuous seam weld and thus speed joining process.



REINFORCING strips, 0.450 in. thick, are spot welded by 200-kva machine to ⅛-in. thick cold-rolled steel plate used as tile mold. Since tiles are for household use, plate finish must be unblemished. Treated paper covers all areas unaffected by welding operations.

Warehouse stocks in all important cities and towns.

SHAWINIGAN

shawinigan PRODUCTS CORPORATION
EMPIRE STATE BLDG., NEW YORK 1, NEW YORK
PLANTS: Keokuk, Iowa; Pryor, Oklahoma; and Shawinigan Falls, Quebec, Canada

NOW . . .
Spatter-Free Weldments
LINDE X-7 Anti-Spatter
Trade-Mark
* SAVES TIME
* CUTS COSTS

Wipe away your spatter problems with this amazing silicone compound. Just apply ready-to-use X-7 to spatter area before arc welding, then whisk away spatter with a dry cloth. It's that easy! Odorless, non-flammable. Economical to use, too. Available in 1-gal. cans, six to a case. See your nearby LINDE Distributor or write for free booklet today.

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A Division of
Union Carbide and Carbon Corporation
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No. 2 No. 6
The RIGHT FLUX for the JOB
No. 16 No. 95

BACKED BY 62 YEARS OF TESTED PERFORMANCE

Whatever the particular job you have to do—we have the right FLUXINE you need. Besides our 25 FLUXINES we carry a complete line of "KOP-R-ARC" coated rods for welding copper and all copper alloys.

Write on company letterhead for chart and generous sample stating which FLUXINE desired.

KREMBS & COMPANY
(Est. 1875)
Dept. J, 669 W. Ohio St., Chicago 10, Ill.

welding machines occupy the main room in the 10,000-sq-ft plant. Seven spot welders and two seam welders handle a large portion of contract work.

In another area of the building are six Tig (tungsten inert-gas) welding stations. Adjacent to these are oxygen and acetylene tanks for the small amount of brazing and silver-soldering done by Spotweld. Also installed in the plant are large tanks for chemical cleaning operations, a small boiler room to provide heat for these tanks, and a pull-test machine with a 60,000-lb capacity.

Resistance welding machines and operators—as well as other Spotweld equipment and weldors—are government certified. The firm also will meet certification requirements and other specifications of any private industrial customer.

Stored-energy, single-phase and three-phase machines make up the resistance welding section. Aluminum and stainless are common metals joined here, but many other types are frequently welded. A 5-kva, 50%-duty-cycle spot welder is the smallest unit; largest are 200-kva seam and spot welders.

Fixturing for Tig

Argon is used exclusively as shielding gas for all Tig welding operations. Aluminum, magnesium alloys, Inconel and stainless steel are just some of the many metals joined in this section. Tig weldors at Spotweld have the added advantages of an accurate fixturing program that leaves nothing to chance.

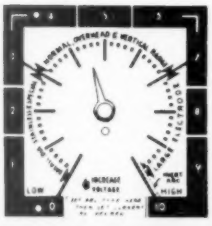
Both a-c and d-c machines, rated from 200 to 300 amp, are used as power sources for Tig welding operations. One of the largest jobs handled in this section is a local one—storm shelters for the Cleveland Transportation System. These all-weather, three-sided shelters are comprised of corrugated aluminum sheets Tig welded to aluminum tubing. Frosted glass is later installed in the lightweight structures.

Space limitations—considered a detriment by some plants—are an advantage to firms such as Spotweld. A small working crew, a few design engineers, and a capable clerical staff have proved to be the ideal ingredients of a closely-knit organization quickly and efficiently turning out products for customers who demand both speed and accuracy.

...for those tough "HARD to WELD" jobs *

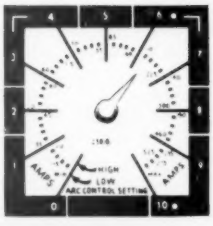
VICKERS Controlarc* DC Welder

Right at your fingertips—exact control—compact, light weight for truly versatile performance



SELECTION OF ARC TYPE

for different welding jobs, and adjustment necessary to suit your individuality and the welding job.



DUAL CONTINUOUS CONTROL

in a rectifier welder. Can vary the current from minimum to maximum, and vary the type of arc, with continuous stepless self-indicating dials.

*TRADEMARK

Gives You REMOTE CONTROL of CURRENT and TYPE of ARC

Even in those tight, cramped places, where there's hardly room to turn around, this handy little remote control box goes right with you. No matter what your welding position, you can "dial" the exact arc you need, without running back to the welder to change range switches and taps. Only the Vickers CONTROLARC gives you this individual control of current and type of arc in convenient remote control operation.

AND ONLY THE CONTROLARC GIVES YOU THESE EXCLUSIVE OPTIONAL FEATURES

Constant Potential (CP) Adaptor • Slope Controller

WRITE TODAY

for more information on this versatile welder.

DESIGN ENGINEERS:

There are openings in our expanding program. Write for details.

VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation

1851 LOCUST STREET • SAINT LOUIS 3, MISSOURI

Welding Progress

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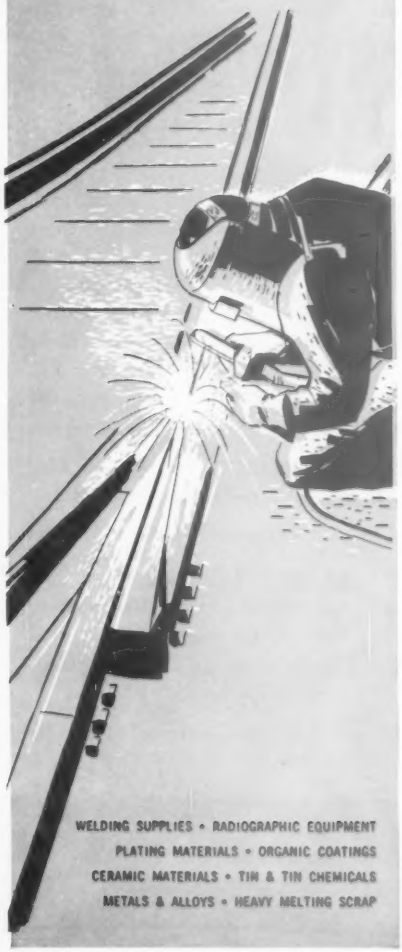
at METAL & THERMIT CORPORATION • General Offices: Rahway, N. J.

IMPROVEMENTS IN HARD SURFACING MADE WITH LOW HYDROGEN ELECTRODES

Hardex Electrodes decrease porosity, penetration, and weld metal dilution, increase resistance to cracking.

Metal & Thermit has recently introduced a new line of electrodes for hard surfacing. Low hydrogen coatings have been adapted to these HARDEX hard surfacing electrodes—a new and different approach to improve the quality and wearing characteristics of hard facing overlays. Weld metal deposited by these electrodes shows far less porosity, greater freedom from cracking, a minimum amount of penetration, and much less dilution of the deposit by the base metal . . . test proven advantages that lengthen the life of the welded surface.

Since no one metal or alloy can satisfactorily meet the requirements of all hard surfacing problems, a complete line of HARDEX electrodes has been developed to give the best in wearing quality at the least cost per pound of metal deposited. Over a dozen different HARDEX electrodes offer hard surfacing materials ranging from 18 to over 60 Rockwell C. Alloyed for a wide range of applications, they perform exceptionally well under standard welding techniques using the electric arc and, in some cases, the oxy-acetylene method. Metal & Thermit's new catalog HS-56 fully describes each electrode, includes a Selector Chart to simplify selection of the right HARDEX electrode for over 200 applications. Your nearest Metal & Thermit representative can supply you with a copy.



WELDING SUPPLIES • RADIOGRAPHIC EQUIPMENT
PLATING MATERIALS • ORGANIC COATINGS
CERAMIC MATERIALS • TIN & TIN CHEMICALS
METALS & ALLOYS • HEAVY MELTING SCRAP

Signs of progress in welding

During the past few months Metal & Thermit has introduced a number of new products for reducing costs in the welding field. Included are all-position iron powder electrodes such as Speedex R (E-6010), Speedex-HTS (proposed E-7018) for hard-to-weld steels, and Speedex-U (proposed E-6014) for high-speed welding; CROLOY electrodes for welding high temperature-high pressure equipment; KEL-RAY Projectors for radiographing welds; and the M&T Controlled Arc Power Supply for constant voltage semi- or full-automatic welding.

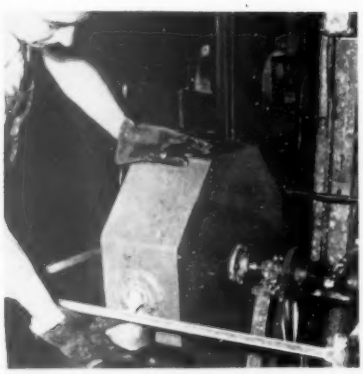
For the latest news on progress in welding keep an eye on M&T Welding Progress.

New E-6013 Electrode

A new improved E-6013 electrode, Murex U-13 assures dependable deposits in any welding position . . . on any type current. This general purpose electrode operates with a quiet, moderately penetrating arc, which is exceptionally easy to control.

Murex U-13 may be used for vertical down welding. In addition to vertical and overhead applications, it is ideal for single pass horizontal fillets and lap welds. Regardless of position, Murex U-13 deposits fast-freezing X-ray clean welds with high tensile strength, high impact and good ductility.

This new electrode operates at high amperages with light spatter. Dense slag, completely covering the deposit, is readily removed.



FLUX drum holds enough premixed flux to last for several shifts. Premixing assures uniformity.

Premixed flux for brazing

WESTFIELD Mfg. Co., manufacturer of "Columbia" bicycles, silver brazes many frame joints. The firm once allowed each operator to mix his own flux, and consistency naturally varied from one brazing station to the next.

To assure correct and economical consistency, and to save time, Westfield centralized the mixing operation. The firm now prepares enough flux in a single batch to supply several shifts.

This method utilizes 60-lb containers of general-purpose flux manufactured by Handy & Harman, and takes advantage of savings in bulk purchases.

Flux is mixed and stored in a rotary drum from which individual containers are filled. Since the drum is sealed between refillings, flux properties remain uniform.

Drum rotation by v-belt drive at 40 rpm provides continuous mixing. A lever-operated coupling on the drum axle disconnects drive, and flux can be poured without stopping the motor. Flux is delivered through a 2-in.-diameter bushing capped with a hexhead nut, to which a handle was welded for ease in opening and closing.

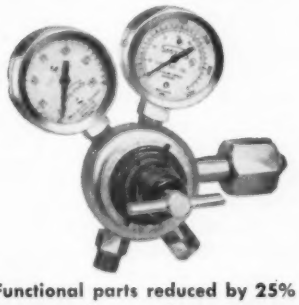
Short longitudinal vanes welded to inside drum walls provide sufficient agitation for constant mixing of flux during rotation. The drum body was fabricated from mild sheet steel, and all seams were welded.

Fewer parts to wear gives you *Longer Life*

SMITH'S Econoflo Regulators

This is a new line of popular priced regulators which give you what you want in accurate trouble-free gas flow control. Functional parts have been reduced by 25%. That means fewer parts to wear, so you get longer life with less maintenance and upkeep costs. The seats are practically indestructible. They resist wear, heat, pressure and corrosion.

An inexpensive valve stem design eliminates need for delicate, costly nozzle. Special valve construction assures smooth, level flow at *all* times from full tank pressure down to empty. Day in and day out, Smith's Econoflo Regulators give you service you'd expect only from regulators costing twice as much. Ask us for full details.



Functional parts reduced by 25%

That means less wear, less maintenance, less time to adjust and operate. These Regulators are built to stay on the job. They let you forget about regulation and concentrate on your work. Special sintered bronze filter protects mechanism against wear from dirt and dust.

New seat stands high temperatures

You can say goodbye to delays from burned out seats. New seat material used in Smith's Econoflo Regulators will withstand temperatures that ignite ordinary seat materials. And, they are impervious to gas and acid reactions.

Full information on request — mail coupon

SMITH WELDING EQUIPMENT CORP.

DEPT.WE-185. • 2633 S.E. 4th Street • Minneapolis, Minn.

NAME_____

ADDRESS_____

CITY_____ STATE_____

PAGE offers a line of —the right packaging—the

In ever-increasing numbers, users of welding wire are looking to PAGE for their wire needs. The one biggest reason is that they have found that PAGE—in a unique degree—has the *facilities, experience* and *special skills* to draw and furnish exactly the right wire for your welding jobs. And behind that lies a story.

All Processes Closely Controlled

PAGE is *the one supplier* of welding wire who is in a perfect position to control the chemical and physical properties of its products all the way from billet to rod to finished wire. That is because we purchase our raw materials to rigid specifications; we select heats of carbon, low alloy and stainless steels for certain optimum characteristics—then, upon delivery to the mill, we analyze representative samples for compliance with PAGE specifications.

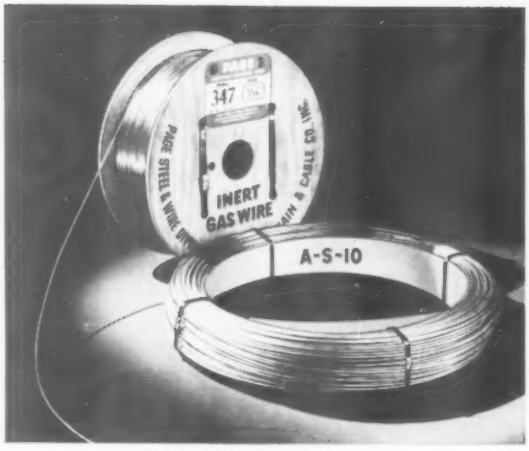
These purchasing and testing practices permit the production of wire capable of depositing weld metal which complies absolutely with welding requirements. *You don't have to compromise* when you buy, specify or use welding wire by PAGE!

Page Meets Today's Needs

One example of PAGE'S facilities for furnishing a wide range of quality-controlled welding wires for modern applications is shown by our stainless steel automatic welding wire. To meet needs of recent developments in the field of inert gas welding, PAGE offers fine wires (.020″ to .09375″) for use in semi-automatic arc welding machines in which the arc is shielded with argon, helium or CO_2 inert gas. These wires, wound on non-returnable plywood reels, furnish the utmost in convenience and freedom of wire feed.

Wire for All Types of Welding

You will find many advantages in standardizing on PAGE welding wire for your needs—whether for automatic or manual use . . . arc or gas welding of all types. Not only does PAGE offer a wide range of analyses, as shown in the column at the right, but we have unsurpassed facilities for manufacturing wire to any desired size, temper or surface finish—and can furnish it promptly, in many methods of packaging, through the convenient nation-wide PAGE Distributor service.



The Right Wire— Wide Analysis Range

There are *26 different analyses* in the PAGE line. These cover the field of applications: heavy automatic submerged arc...light manual submerged ...inert gas manual...automatic, tungsten or metal arc.

AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.90-1.10)

LOW ALLOYS...All the most popular welding grades.

STAINLESS...All standard AISI grades. Other types on request.

GAS WELDING RODS

Since 1914, the standard of quality, uniformity and satisfactory performance. PAGE offers an exceptionally wide range of rods—furnished in 36-inch lengths, in coils or on reels in the following materials: Mild Steel · Armco · Low Alloy · Carbon Steel · Stainless Steel · Manganese Bronze · Naval Bronze

BARE ELECTRODES

PAGE Bare Electrodes are supplied in any carbon from Armco to high (.90-1.10) carbon.

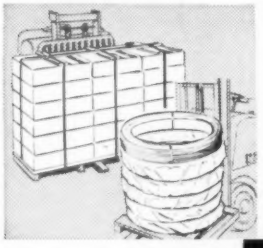
METAL SPRAY WIRE

Furnished as follows: Any carbon from Armco to 1.00 carbon · Low Alloy · Stainless Steel · Manganese Bronze · Naval Bronze

the right welding wires
right service—for modern needs

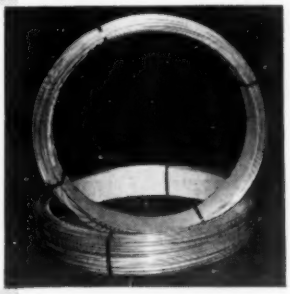
PAGE WIRES ARE PACKAGED RIGHT

PAGE Welding Wires are packaged in a wide variety of ways for the most complete protection and the utmost convenience in handling, in stocking and in use.



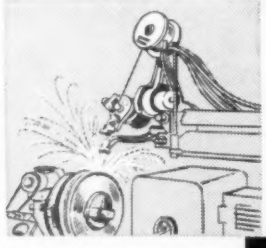
Wrapped Coils and Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproofed paper. ...Also, coils in individual cartons, singly or palletized.



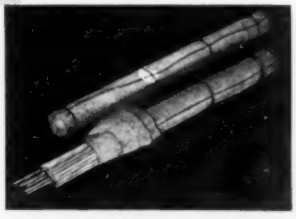
Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer wound coils with cardboard liner, four Signode straps to facilitate coiling and easy unwinding.



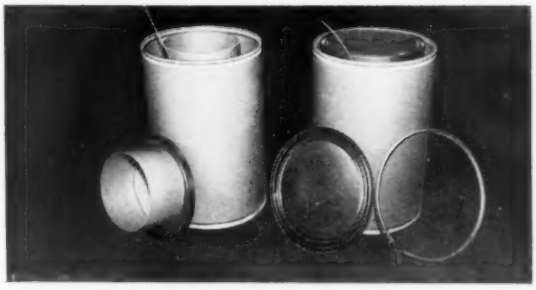
Handy Reels

PAGE Inert Gas Welding Wire is available on reels: Precision thread-wound on twenty-five-pound, non-returnable reels to fit all popular inert gas welding machines.



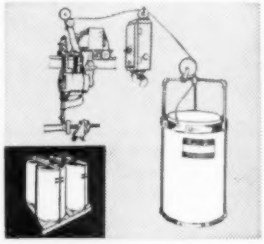
Gas Rod Packing

Gas welding rods are packed in 36" lengths in 50-lb. bundles—paper and burlap wrapped. Also in coils and reels (approx. 150 lbs.)—burlap wrapped. Stainless rods also come in 10-lb. fibreboard cartons.



LEFT: Pay-off-pak ready for filling, with "wire slinger" for uncoiling at extreme left. RIGHT: "Wire slinger" installed for feeding out wire; also, below, re-usable lid and retaining ring. Ring insures smooth feed-out of wire without snarls or kinks.

Sketch at right shows Pay-off-pak for continuous feeding up to 500 lbs. of wire without rethreading. Also (inset) lightweight Leverpaks. Both these containers protect against coil distortion... are easily opened, resealed, handled, stored.



PAGE Service Means Prompt Delivery From Local Stocks

You can get PAGE automatic arc welding wire, or oxy-acetylene welding rods quickly and easily from your nearby PAGE Distributor.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory.

Send For These

Folder **DH-402A**—PAGE Submerged Arc and Inert Gas Welding Wire.

Booklet **DH-1277**—PAGE Gas Welding Rods.

Write our Monessen, Pa., office for *either or both*

ACCO products

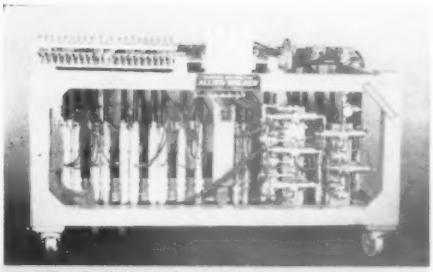
ACCO

TRADE MARK

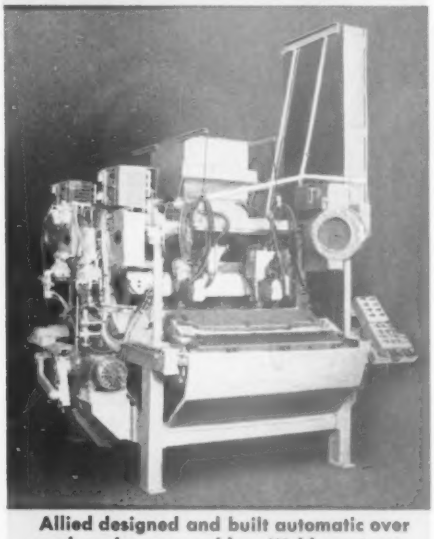
Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

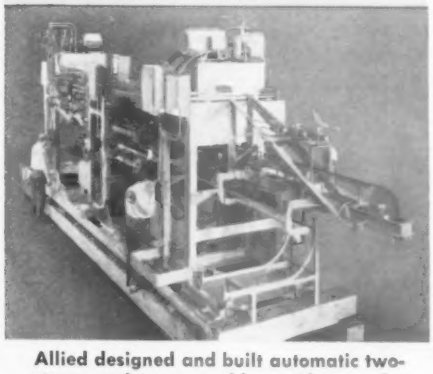
Better Value



Allied designed and built air operated machine for drilling 20 holes simultaneously in trailer floor.



Allied designed and built automatic over and under arc welder. Welds automotive frame X member.



Allied designed and built automatic two-stage resistance welder with transfer and turn over devices. Welds radiator support assembly.

how big is your problem . . .

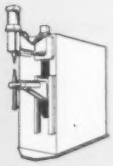
Really?

If it involves special equipment for a production welding operation it may not be a problem at all— just an assignment when placed in competent hands.

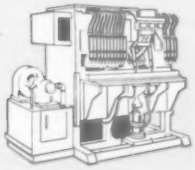
This is our kind of work – we specialize in it – do it every day; designing and building special machines for welding everything from bathtubs to trailers, frequently including provisions for automatic handling and transfer where the job is a part of a production line set-up.

We're no brain trust here at Allied Welder, but we keep some awfully important production people happy with our creative designing and manufacturing know-how, delivery, too.

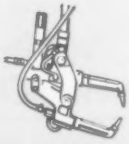
May we work with you on your next job?



Standard Welders



Special Welders **Automation Equipment**



Automatic Arc Welders **Welding Guns**

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Creative Design

RECTIFIER type d-c welding machine is used for all Tig welding on high-temperature centrifugal pump. It is equipped with crater eliminator and is used at 60 amp during operation. Inert-gas is argon and tungsten electrode holder is ceramic type.

Nickel-alloy pump is Tig-welded for AEC

By E. Nutter, *President*
Elano Corp., Xenia, Ohio

A LOW-HEAT-INPUT welding technique is producing sound, highly uniform nickel-alloy joints in the production welding shop of Elano Corp., Xenia, Ohio.

A specially designed centrifugal pump, made of semi-finished nickel alloy components, is being produced by Elano for the Atomic Energy Commission.

Because of complex operating and service conditions demanded by the atomic energy program, it is often necessary to develop and utilize variations of standard fabricating techniques.

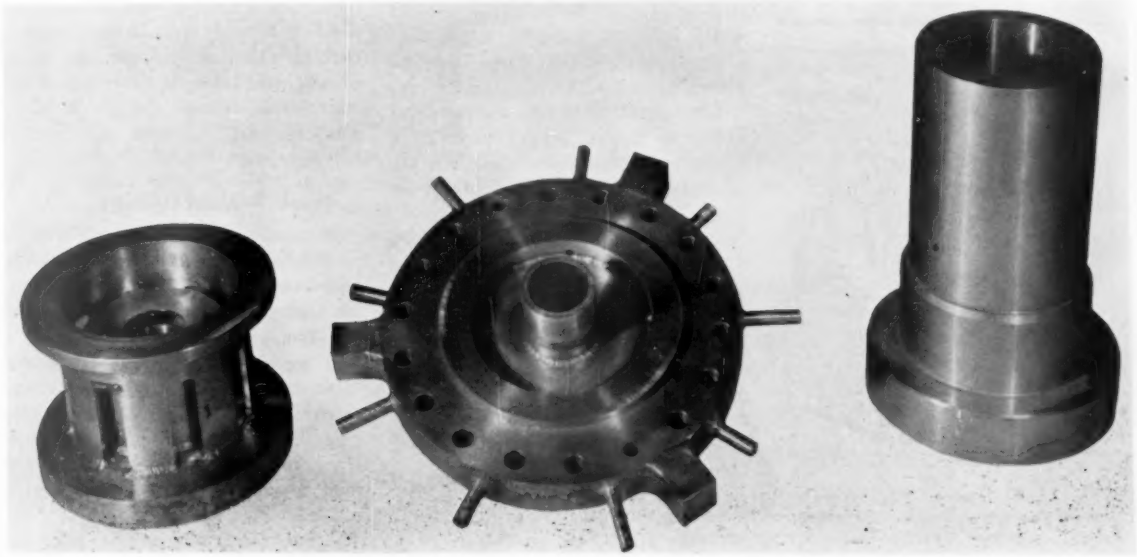
Such is the case with Elano's centrifugal pump assembly. All welds are made with the Tig (tungsten inert-gas) welding process, using small-diameter welding rods and a multiple-pass technique.

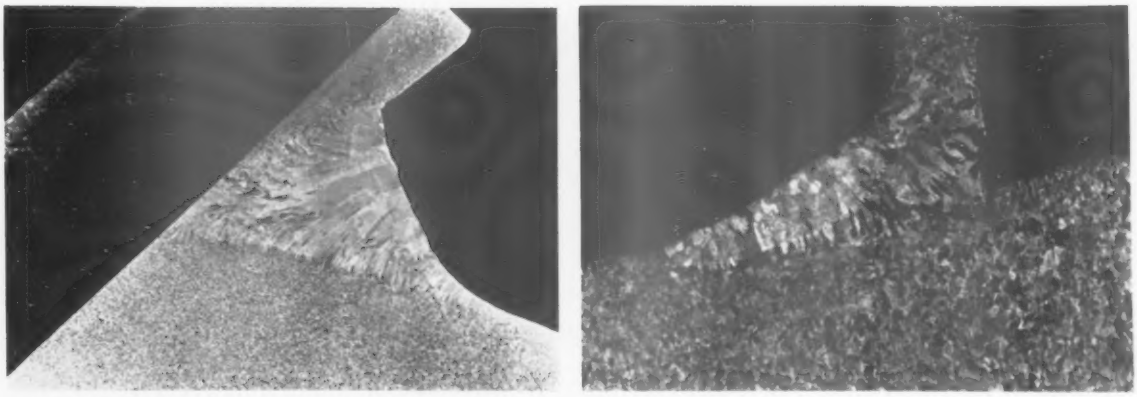
Special Nickel Alloy

Since the pump operates under high pressure and handles extremely corrosive fluids as hot as 1,800 F, it is made of a special nickel alloy. A complete pump with a 16-in.-diameter body, contains about 20 separate parts welded at different points.

For average production welding operations, nickel alloys possess characteristics similar to those of low-carbon steel. Therefore, they can be welded by arc or oxyacetylene processes. Arc methods are more com-

SEVERAL complete assemblies as welded by low-heat-input welding technique. Method is said to produce sound, highly uniform welds.





PHOTOMICROGRAPHS of typical weld sections are etched to show grain structure in base and weld metal. Note highly uniform structure within weld area and minimum growth that has taken place in fringe areas before stress-relief heat treatment. LEFT: Section through nozzle port where hole is bored through both parent and weld metal to produce outlet for pump. RIGHT: Section through thin-section flange welded to heavy base.

monly used because of better mechanical properties produced in the weld metal.

Argon is employed in preference to helium as an inert-gas because of its heavier atomic weight and better shielding action. This action results in prevention of slight oxidation and in consistent production of clean root surfaces for every bead.

Since nickel-alloy weld metal does not spread or flow so much as mild and low-alloy weld metal, and penetration is not so deep, excessive heat input had to be avoided.

Multiple Passes Needed

Therefore, joints were designed to receive (and the Tig method was selected to give) low heat input—in this case about 60 amp, even for weld sections up to 2 in.

Combining shallow penetration characteristics of nickel-alloy weld metal with the desirability of lower weld temperatures, it was found that multiple passes using 3/32-in.-diameter rods would be needed. The resulting practice was termed a "cold welding" technique.

A typical joint, welding outlet port to impeller housing, requires approximately 40 passes to build up a concentration of weld metal 2 in. through its heaviest section.

Contrary to accepted practice, a straight bead is laid down. The usual weaving motion is eliminated since it deposits too much metal and encourages detrimental puddling. Welding rod is dipped into molten parent metal, and the action is repeated at a steady rate until the bead is completed.

The multiple-pass, narrow-bead technique keeps temperature at a minimum and causes only slight grain growth in the fringe area of parent metal.

"OK, I'll tell you why I left my last job—if you tell me why your weldor left this job!"

Contour Maintained

It also produces a uniform structure in the weld metal it builds up. The end result is a strong, ductile and sound weld closely approximating base metal characteristics, and approaching maximum physical characteristics attainable with cold-drawn, nickel-alloy rod.

Tensile strength:
95/150,000 psi as drawn
80/100,000 psi annealed

Yield strength:
70/125,000 psi as drawn
25/ 50,000 psi annealed

Elongation:
30/15% (in 2 in.) as drawn
50/35% (in 2 in.) annealed

Hardness:
8/30 Rockwell "C" as drawn
65/85 Rockwell "B" annealed

The multiple-pass technique assures maximum resistance in the weld area—resistance equal to that of parent metal. Conditions of absolute cleanliness are maintained at all times for parts being welded, and also for weld metal as it is laid down in the joint.

Nickel and high-nickel alloys are highly susceptible to embrittlement at welding temperatures if they contact such materials as lead, sulphur, phosphorus, and other low-melting alloys and metals. Grease, oil, paint, lubricants, fingerprints and perspiration will also cause trouble.

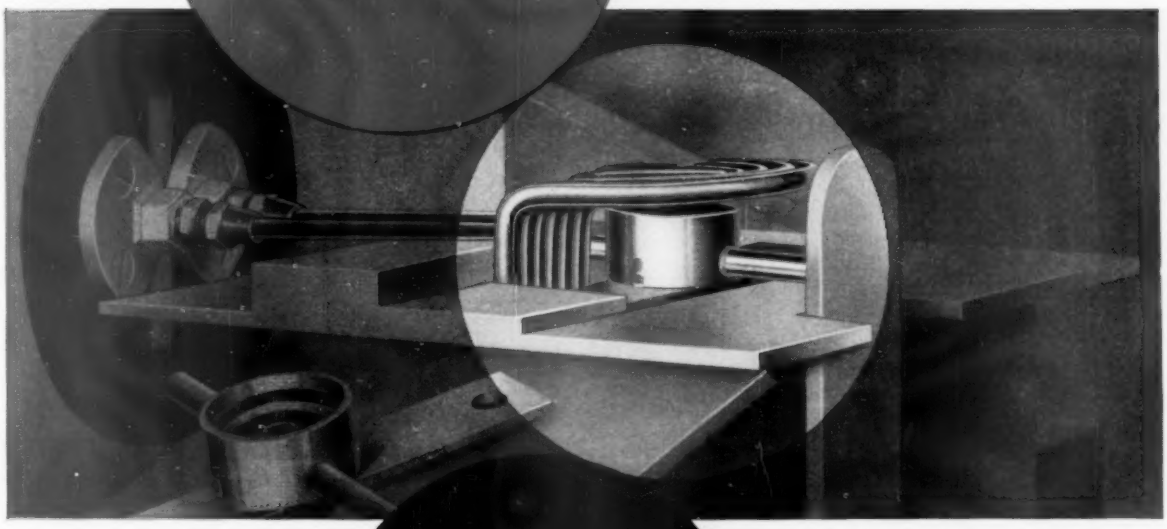
Brush Removes Chips

To remove foreign materials, each part is vapor-degreased and given a carbon tetrachloride rinse before setup. Gloves are worn by all workmen handling parts.

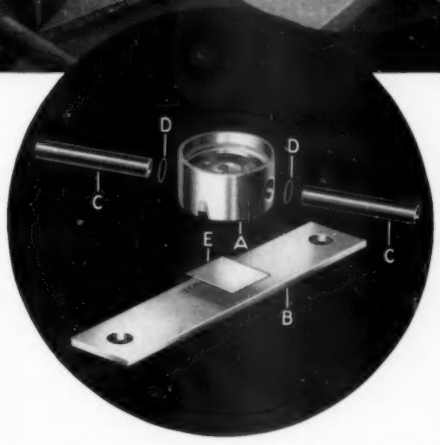
If metal must be removed in the joint area before or during welding, machining, filing, or rotary de-burring is used in preference to abrasives. Resulting chips or filings are then removed by stainless steel wire brush.

Argon (99.8% pure) is used for

PHOSON SIMULTANEOUSLY BRAZES 3 GAS-TIGHT JOINTS IN 60 SECONDS



Assembly in position for induction brazing, and fully brazed assembly in slide off cooling position.



This bypass valve, for use with a telephone cable pressurization program, was designed for *strength, gas-tightness, corrosion resistance, long life* and *mass production.*

Here's what the problem involved: a brass machined hub (a) had to be fastened to a plate (b) and two copper tubes (c) fastened to the hub. Because the finished joints had to embody all the requirements of the base materials, low temperature brazing with Phoson and Sil-Flux was chosen. Two Phoson rings (d) ¼" ID x .031 wire and a Phoson shim (e) ¾" square x .003 were specified. By induction brazing with Phoson and Sil-Flux, the four parts were joined simultaneously in just 60 seconds!

For dependable, economical mass production metal joining, with *highest* possible strength at *lowest* practical temperatures, specify L.T.* brazing — and for L.T.* brazing alloys . . . specify the best: Phoson or Sil-Bond with Sil-Flux.

*Low Temperature

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this application because of its excellent shielding action. It not only produces a smooth, quiet arc, but also minimizes erosion of tungsten electrodes and eliminates porosity in weld metal.

To insure best possible joints, all welds are made in the downhand position with electrode inclined about 20 deg from the vertical. Bare welding rod, hand-fed from the other direction by the operator, is held at a slight angle and carefully drawn along the joint to produce a straight bead. Ideal average welding speed at 60 amp is less than 1 in. per minute.

The d-c, rectifier-type welding machine used for this work is equipped with a crater eliminator that automatically reduces current and voltage at the end of each pass. This prevents formation of a crater and provides an excellent condition for restriking.

Soundness Test

By using a copper striking block positioned against the piece slightly above the joint, a restrike can be made safely and the electrode can be drawn down the block to the joint. This action minimizes possibility of breaking a tungsten tip which might drop into, and contaminate, the weld area.

After each bead is laid down, it is checked for soundness by the liquid dye-penetrant method. If voids are visible to the eye, they are removed before dye checking.

When imperfections are detected by developer fluid, the bead is cut back by rotary burr until subsequent dye checks reveal sound metal. *At no time is an abrasive of any type used in weld preparation or finishing.*

All dye material is carefully removed before the next pass. This procedure is repeated as many as 40 times in some joint areas—until the required amount of sound weld metal has been built up.

Oxidation Prevented

To meet specifications dictated by service life requirements, a stabilization heat treatment at 1,500 F is given to each part. To protect metal surface and retain maximum corrosion resistance, an atmosphere of helium and 30% hydrogen is used throughout the 40-hour heating and slow-cooling cycle.

Helium prevents surface oxidation and retards intergranular corrosion caused by iron in the alloy. Hydrogen further prevents oxidation by combining with occluded oxygen encountered in these parts.

STABILIZATION or stress-relief heat treatment is carried out on each part of pump after welding. This electric furnace uses atmosphere of helium and hydrogen maintained at 1,500 F throughout 40-hour overall cycle.

Heat treatment is carried out in a full, muffle-type electric furnace equipped for forced circulation of atmosphere in the muffle. The work is charged on special fixtures and the muffle is purged with atmosphere gas at the beginning of the cycle.

10-Hour Cooling

The charge is heated from cold to 1,500 F and held at that temperature for 24 hours. It is then cooled slowly (8-10 hours) to room temperature before final machining operations.

Although heat treatment is often not required for nickel-alloy weldments, high-temperature stabilization must be used if the ultimate in physical properties is required. This is because hot-worked nickel alloys require stress relief to develop the best combination of strength and ductility. It also insures against distortion and warping during machining.

After final machining, certain welded assemblies are tested for leakage. For this operation, parts are heated to 250 F and given an internal pressure of 5 psi with freon gas.

Elano Corp.'s unusual fabrication method typifies the technical variations demanded of industry as atomic energy becomes more widespread in power plants, industrial production, research and development.

"Relax . . . this isn't a holdup—somebody 'phoned for a weldor."

Erosion From Molten Copper Reduced 300%

23-Ton Ladle Protected With HASCROME rod by Submerged-Arc Method

The hard-facing operation shown above will increase the service life of this cast steel ladle by as much as 300 per cent. The material being applied is HASCROME rod . . . a high chromium alloy that effectively resists the destructive chemical action of molten copper. The alloy is deposited on the bottom and spouts of the ladle . . . the areas most vulnerable to erosion during pouring operations.

Despite the size of the ladle . . . 6 ft. high and about 8 ft. in diameter . . . the facing operation was accomplished rapidly. Coiled rod, applied by mechanized submerged-arc equipment, was used to cover the bottom and the spouts of the ladle. Facing speed averaged 7 inches per minute. Manual metallic-arc equipment and 14-in. long coated rods were used to face the contours around the spouts.

HASCROME rod, used so successfully here, is an iron-base material that also excels in applications requiring a tough, abrasion-resistant alloy. It has outstanding resistance to impact and sudden shocks.

There are 19 HAYNES hard-facing alloys . . . a wide selection that guarantees you the right rod at the right price for your wear problem. They all can be deposited with standard welding equipment. For descriptive literature on the complete line of HAYNES rods, contact your nearest Haynes Stellite Company office.

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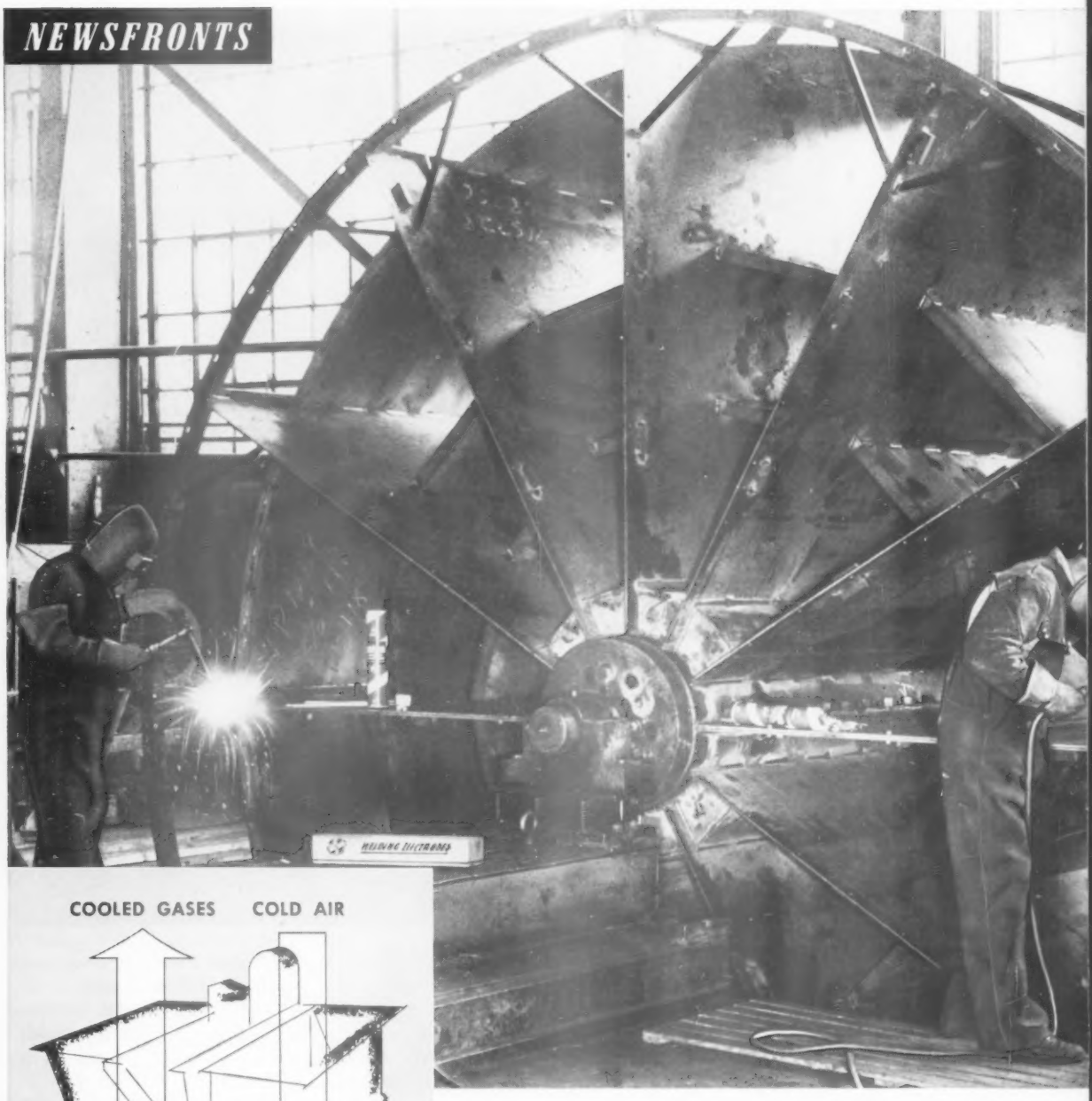
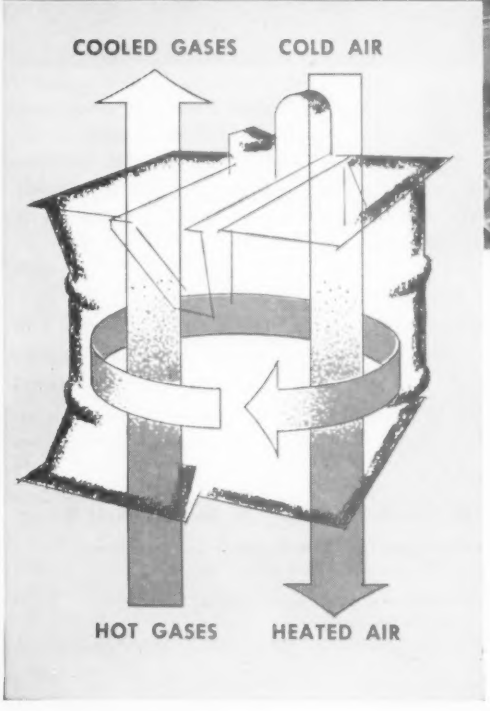


In welding this huge rotor, fit-up must be well above average. The A. O. Smith SW-35 electrodes are easy to use, provide a fine spray, smooth arc, good bead and are ideal for the application.



As the rotor in the Air Preheater revolves, its welds are subjected, alternately, to near-flaming gases and cold incoming air. Extreme ductility is a must — the SW-35 provides it.

Hot rods keep heat-saver cooking!

Welds on rotor of Ljungstrom Air Preheater must have strength to carry substantial moving weight . . . ductility to withstand extreme temperature variations. They're made with A. O. Smith SW-35 (E-6020) mild steel electrodes.

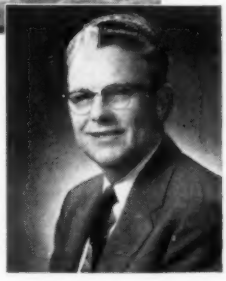
Made by The Air Preheater Corp., New York, the Ljungstrom Air Preheater is used in conjunction with boilers. By utilizing hot exhaust gases to pre-heat incoming cold air, it improves boiler efficiency and life, saves on fuel and fuel costs.

Essentially, the unit involves a huge rotor that carries heating elements. In revolving, the rotor first puts the elements in a position to absorb heat from the hot gases, then in a position to impart the stored heat to incoming cold air. Thus, the welds on the rotor must not only have strength to carry a substantial load, but must also have the ductility to withstand extremely fast temperature changes of one-thousand degrees or more!

For these welds, Air Preheater is using A. O. Smith SW-35 (E-6020) mild steel electrodes. Of the mineral type, the SW-35 is often referred to as a "hot rod" because of its high rate of deposit in downhand, horizontal or positioned fillets, flat work and in deep groove welding where extreme ductility is necessary. The SW-35's overall efficiency is high because it's quiet operating with fine spray and smooth arc. Bead appearance is good, produces smooth 45° fillets without undercut. Slag is easy to remove and x-ray quality is excellent.

What's your welding problem?

If you're seeking faster, more economical ways to handle present jobs . . . searching for a way to produce welds with unique characteristics . . . planning new products that will require development of entirely new characteristics — contact your "man from A. O. Smith." He's backed by the industry's most experienced, most extensive research and development facilities and will be happy to assist in solving your problems.



The man from A. O. Smith . . . Myron Ockerman is the A. O. Smith welding consultant who worked with Air Preheater Corp. More than a salesman, he's a welding specialist, ready and eager to help with any welding problem.

PRODUCED BY WELDERS—FOR WELDERS — Because welding is our full-time business, we offer you America's finest welder-proved electrodes, machines and accessories.

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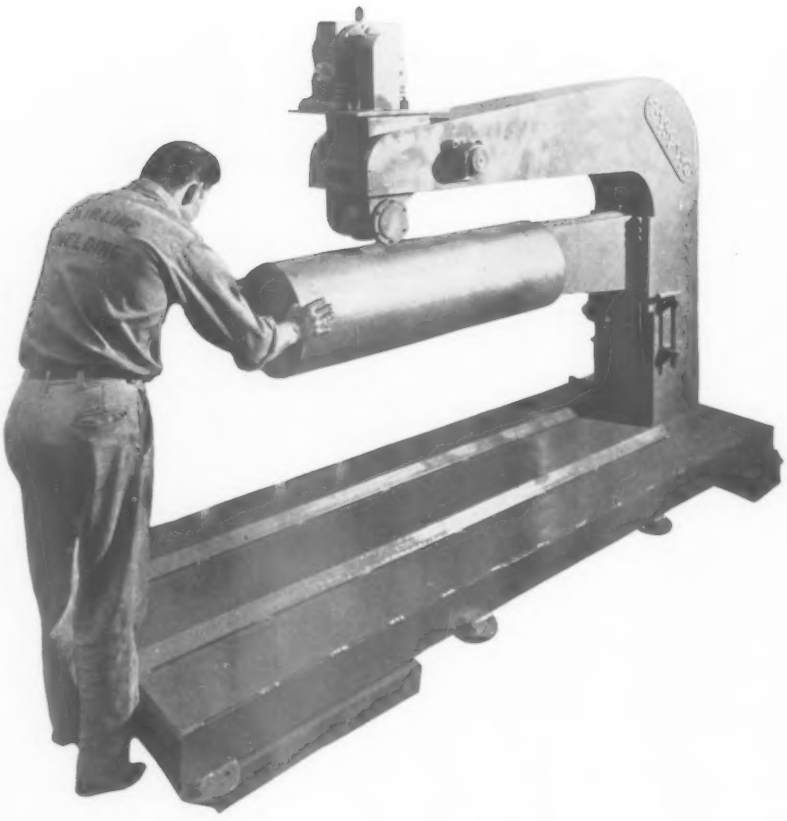


AT RIGHT: Workman places seam welded tube over machine arm holding idler roll. Driver roll will be lowered to planish submerged-arc weld, improving joint quality and efficiency. This 10-ton machine can exert a 20,000-lb pressure between rollers.

BELOW: Aluminum nose cone section for guided missile was first subject for roll planishing at Airline. Tig welded seam failed during last stages of subsequent bulge-forming operation. Planishing improved joint efficiencies 100% in this and other production items.

Roll planishing gives improved joint efficiency

By H. L. Meredith *and* **B. R. Russell**
Airline Welding & Engineering
Hawthorne, Calif.

WE OFTEN HEAR and read how Tig (tungsten inert-gas) and Mig (metal inert-gas) welding processes are being given increased uses with gratifying results.

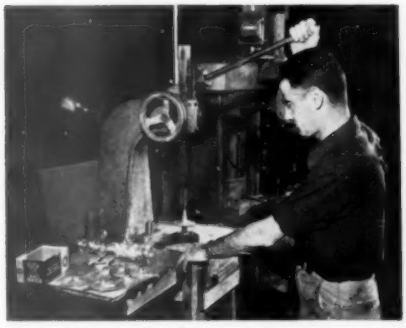
Seldom told is the story of painstaking efforts and procedures necessary to attain these good results.

Although the processes themselves are designed through scientific studies, it still takes a skilled operator to handle the torch, whether it be manual, semiautomatic or fully automatic.

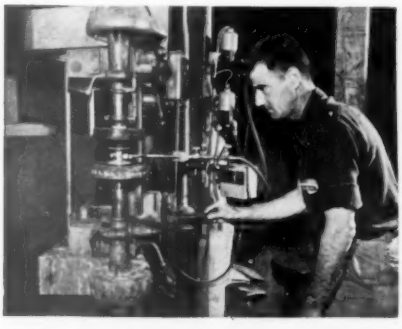
To produce *top quality* weld joints, whether they be in 17-7 stainless, unalloyed titanium, aluminum, or weld-

This article is based on a paper presented by the authors to a meeting of the American Welding Society.

JOIN WITH HANDY & HARMAN SILVER BRAZING FOR PERMANENT PROFIT



Inserting fluxed spindle and EASY-FLO silver alloy ring into lower half of spool. Assembly is completed when upper half of spool is pressed onto spindle. Press fit is necessary to maintain proper joint clearance between brass spool and steel spindle at brazing temperature.



Sliding burner assembly into heating position. Weight of upper platen assures accurate joint fit when ring of EASY-FLO alloy melts. Fuel is mixture of city gas and oxygen. Operator brazes 20 to 30 spools per hour.

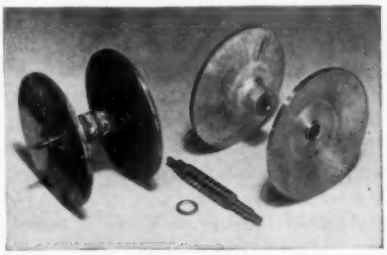
This Yarn Has Fishermen Reeling ...With Absolute Confidence

Anybody who has ever caught a big fish knows the importance of a good reel. That's why manufacturers of fishing tackle are striving constantly for improvements in both design and production methods.

For example, when nylon line first appeared, Ocean City Manufacturing Company, the country's largest manufacturer of fishing reels, realized that the design of the reel spool would have to be changed. This because, with a big one on the line, the tremendous compressive forces of tightly wound elastic nylon often caused the spool flanges to spread so that the spool bound against the reel housing. Silver brazing with Handy & Harman EASY-FLO 45 silver brazing alloy and HANDY FLUX permanently and simply solved this serious problem.

Originally the spools were assembled from two fully machined brass forging halves with the hollow hub of each half fitted over a solid steel spindle with the drive clutch at one end. Each half was secured with 3/16" stainless steel pins driven through the spool hub into the internal spindle.

The same spool components are still used except that now semi-machined brass spool halves are silver brazed directly to the steel spindle with a preplaced ring of EASY-FLO 45 alloy. The shear strength of the brazed joint now exceeds 40,000 psi and because of the greater area of adherence to the spindle (as compared to two stake points previously used) spool hub creep toward the spindle ends is eliminated. The alloy cost is only 1.3 cents. The assembled spool is now finish-machined as a unit. The machining time once required for drilling and aligning has been eliminated. And when time is reduced and a product is improved, costs are reduced and sales are improved.



These same benefits could easily apply to the production of your product. The simple fact is that silver brazing with Handy & Harman brazing alloys has paid off handsomely for those who use it. The only way to find out if and how your product or methods fit the picture is to ask us —we'll be delighted to work with you all the way.

TO HAVE AND TO HOLD

BULLETIN 20 tells you why high strength, speed and economy are inherent in EASY-FLO silver brazing. Also gives Handy information about joint design and fast brazing methods. We'll be pleased to send you a copy.

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able 18-8 stainless steel, the weldor must understand seven basic weld variables. He must also have good welding equipment.

Joint Strength Loss

Loss in weld joint strength is attributable to four main factors. Foremost is a loss in tensile strength due to the weld being a cast metal. The second factor is loss in ductility.

Third is the notch effect caused by abrupt change in thickness at the weld edge. The fourth factor is attributable to enlarged grain structure in the heat-affected zone; the transition from a cast to a laminated structure is not uniform.

To gain tensile and yield strength in manufacturing sheet metal, it is necessary either to heat-treat or cold-work the hot-rolled structure. In the case of wrought materials (metals which do not respond to heat treatment) cold-working raises ultimate tensile and yield strengths and improves ductility *if not overdone.*

Some metals which respond to heat treatment are also susceptible to cold-working. For instance, improvement in mechanical properties of 2024S aluminum, particularly yield strength, is much greater if the metal is cold-worked prior to artificial aging.

The small amount of stretching (about 1%) necessary to remove buckles and distortion after quenching is sufficient to cause an increase in yield double that developed by sheet that has not been cold-worked.

Roll Planishing

Objectives of roll-planishing welds are many. The principle is to improve mechanical properties of a weld joint.

The first use of roll planishing at Airline was on the aluminum nose cone section of a guided missile. A photo with this article shows a completed nose section that failed during proof testing. This type of failure occurred on innumerable parts and soon had production stopped due to high scrap percentages.

In an effort to eliminate these failures, longitudinal welds were hammer-planished to cold-work the weld. Pressure tests showed no failures; welds were producing 100% joint efficiencies.

Because hammer planishing required skilled metalsmiths and was too slow for high production, however, a machine was needed.

Another illustration shows a heavy-duty 10-ton roll planishing machine built for Boeing Airplane Co., Seattle. The machine was proof-tested by planishing square butt welds in 12-gage mild steel.

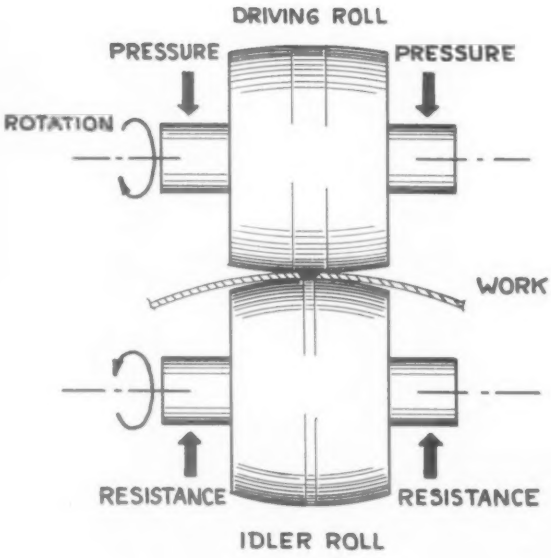
Simple Construction

The mechanical roll planisher is simply constructed. Two rollers, diametrically opposed, exert pressure at a small contact area on the weld. The top roller is a driver, and the lower a follower.

Extremely high or low loads may be exerted upon contact. Magnitude of output load can be adjusted pneumatically, from zero lbs to 20,000 lbs.

If a weld ¼ in. wide is to be roll planished, a compressive force as high as 416,000 psi may be attained if the driver makes ⅛-in.-wide contact (using 6½ tons force).

Correct application of the roll planishing process to



Roll planishing process

any metal is dependent upon six variables:

1. Base metal thickness
2. Weld width and contour
3. Weld reinforcement height
4. Roll-planishing pressure
5. Roll-planishing surface speed
6. Surface finish

Of these variables, weld reinforcement height and weld width are the most important and must be rigidly controlled during welding.

Weld Width

For a given metal thickness, weld width should be held to a range of 3 to 5 times base metal thickness. This ratio is in agreement with good joint design practices and also represents an economical balance.

This rule-of-thumb applies to all metals—aluminum and magnesium being hardest to control. Where filler metal is used, height of weld reinforcement for both weld bead crest and root should be held at a constant value of + 0.015 — 0.000.

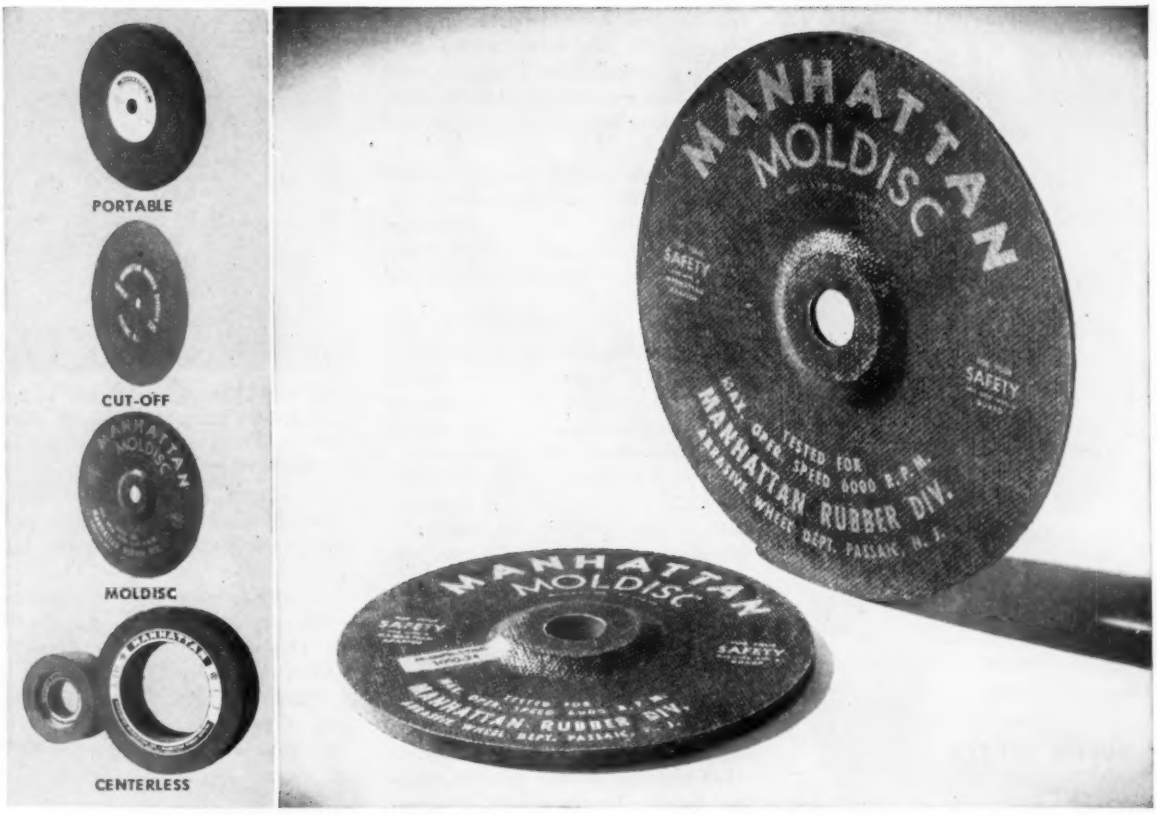
This means that less filler wire is required—another savings in manufacturing.

Where no filler wire is used and the weld joint is merely fused together, weld bead height above base metal surface is generally zero or concave. Therefore, it is necessary to control concavity in metal thickness of 0.020 to 0.070 in.

Where concavity is obtained it should never exceed 0.010 in. in depth. If welding procedure is changed and a convex contour is obtained, reinforcement should not be greater than 0.015 in. above base metal surface. These rules apply also to weld root reinforcement.

Effect of Weld Size

Another objective of roll planishing is to relieve weld shrinkage strain and to flatten and smooth weld surfaces. Consequently, it is necessary to control cross-sectional mass of the weld. If bead crest height is



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Every turn of a Manhattan Moldisc exposes a fresh, sharp abrasive surface right down to the last usable part of the wheel. Tests prove Manhattan Moldiscs are the most economical portable grinding wheels you can use on right angle grinders. They cut freely, even on the toughest roughing and finishing jobs. This is because Manhattan Moldiscs are custom-made for your specific requirements in mild steels, stainless alloys, aluminum or copper. They're *safer* and *easier* to use because they're light in weight and reinforced with special super-strength synthetic fabric to prevent breakage on the job.

Ask a Manhattan abrasive wheel engineer about the wide range of types in Manhattan Moldiscs from harder, stiff bonds for fast roughing . . . to resilient bonds for fine finishing. Ask him, too, about Manhattan Portable Wheels, Cut-Off Wheels and Centerless Wheels. For *every* cutting or grinding operation there's a high speed, heavy duty Manhattan Abrasive Wheel to do the job *better*, *faster*, at *lower* cost . . . to give you "More Use per Dollar."

RM740

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

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greater than base metal thickness, it is apparent that when excess weld metal is squashed back into the weld area, adjacent base metal must move. This causes excessive distortion and *canning*.

The basic concept is very simple: minimal weld reinforcement is required so that it may be compressed enough to refine surface grain structure, counteract shrinkage strain and also be flattened.

Amount of cold-working a cast weld structure will take is dependent upon many factors. Roll planishing is limited only by characteristics of wild joint configuration and metallurigcal limitations of base metal.

A square butt weld in 0.040-in.-thick 2S-0 aluminum, for instance, may be planished several times at a 40-psi gage pressure. A square butt weld in 0.040-in.-thick Ti75 titanium, however, may only be planished once.

Weld Shrinkage

It is a well-known fact that long welds in square butt joints will shrink transversely and longitudinally. Rate of longitudinal shrinkage is uniform when welding is done in a longitudinal fixture. However, rate of transverse shrinkage increases as length of weld increases.

Recent inert-arc butt weld tests made by a reliable source showed average transverse shrinkage in 0.027-in.-thick stainless sheet (type 301 extra-hard) was approximately 0.010 to 0.012 in. in the as-welded condition.

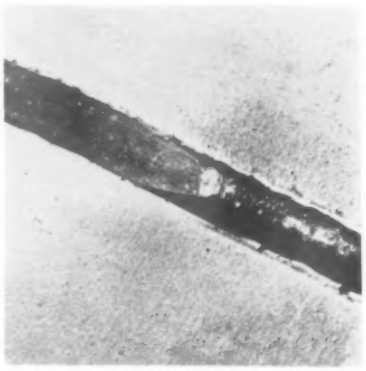
By roll-planishing welds at 40 psi on a standard machine, overall shrinkage was partially reduced. Micrometer measurements revealed average final shrinkage dropped to 0.008 in.

To clarify this information, further tests were made. Tests consisted of welding six panels together. Each panel was sheared to a nominal width of 4 1/16 in. wide by 18 in. long. Material was type 301 full hard, 0.025 in. thick.

Close Measurement

After milling each edge square, exact width of specimens was measured in thousandths of an inch; average width was 4.0098 in. When each panel was laid side by side, total width came to 24.059 in.

Five Tig welds were made, fusing the square butt joints together without filler wire. Welding was done in a production welding fixture incorporating a *chill-shunt* tooling principle *(see* WELDING ENGINEER, *July, 1956, p. 40.)*



SUBMERGED-arc weld in 12-gage mild steel has been partially planished. Pressure rolls flatten and smooth the weld bead.

Final dimension across starting end of the welded specimen was 24.007 in. This gave an average shrink of 0.0104 in. per weld.

Final dimension across finishing end of the specimen was 23.989 in. This gave a total shrinkage of 0.070 in. or an individual shrinkage of 0.014 in. per weld.

In 18 in. of weld length, therefore, difference in as-welded shrinkage between starting and finishing ends is 0.0036 in.

Roll Planishing

Welds were roll planished after shrinkage was measured. Gage pressure of 40 psi was used with a 3/4-in-wide flat area on the top roller face and a 6-in radius contour on the bottom roller. This combination was necessary because weld bead crest was slightly concave.

Each weld was given a single planishing pass. Final total measurement across the starting end was 24.012 in. This showed: *(1)* average expansion was approximately 0.0045 in., indicating uniform planishing, and *(2)* slight cumulative increase in expansion can be expected with straight-through planishing.

Since roll planishing is relatively new to the light-metal fabrication field, the most obvious question is: *"How does planishing affect weld strength?"*

Roll planishing has increased ultimate tensile and yield strengths, slightly decreased elongation, and improved fatigue strength of weldments to which it has been applied.

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Doing its part in the nation's highway improvement program, this modern shipyard uses oxyacetylene torches, combined with radiagraph units, to do . . .

Flame-cambering of beams for bridges

FLAME-cambering is done by running three heating torches (mounted on radiagraph unit) along flange of beam. Camber accuracy within nearest ¼ in. can be obtained.

By A. H. Yoch
Air Reduction Sales Co.
Philadelphia, Pa.

MANY facilities in modern shipyards are adapted to a wide variety of production work not associated with shipbuilding.

An example of this diversification at New York Shipbuilding Corp., Camden, N. J., is flame-cambering of beams for bridges. This work is part of the nation's highway improvement program.

Camber in a beam is a convex upward curvature introduced during fabrication principally to compensate for sag or deflection under weight of the beam and any loads it must carry.

Camber Specifications

Sometimes curvature is sufficient to leave a substantial amount of camber after deflection, fitting a vertical curvature in the roadway.

In determining amount of camber desired in a beam, effects of future welding operations are also considered.

Mill tolerances and standard practices will not meet camber specifications, and shop equipment is not available for cold bending these large sections. The camber required can vary from less than 1 in. to 6 in. in steel beams which may range from 40 to 100 ft in length.

Flame-cambering is accomplished by running oxyacetylene torches at controlled speeds and heats along the flange of a beam. Accuracy of camber can be obtained within the nearest ¼ in.

Continuous Run

At New York Shipbuilding, flame-cambering is performed with a radiagraph unit on which three torches fitted with special heating tips are mounted.

The unit is started on top of the flange of an upright beam and run continuously over a specified area. Sometimes it is run full length, at others, over a localized area only.

Progressive heating speeds of 11 to 26 in. per minute are used. Two runs in this range are more successful than a single run at slower speeds.

It is generally necessary to obtain a rise of two to three times the camber desired. Amount of rise can thus be used as a guide for the approximate camber remaining after cooling.

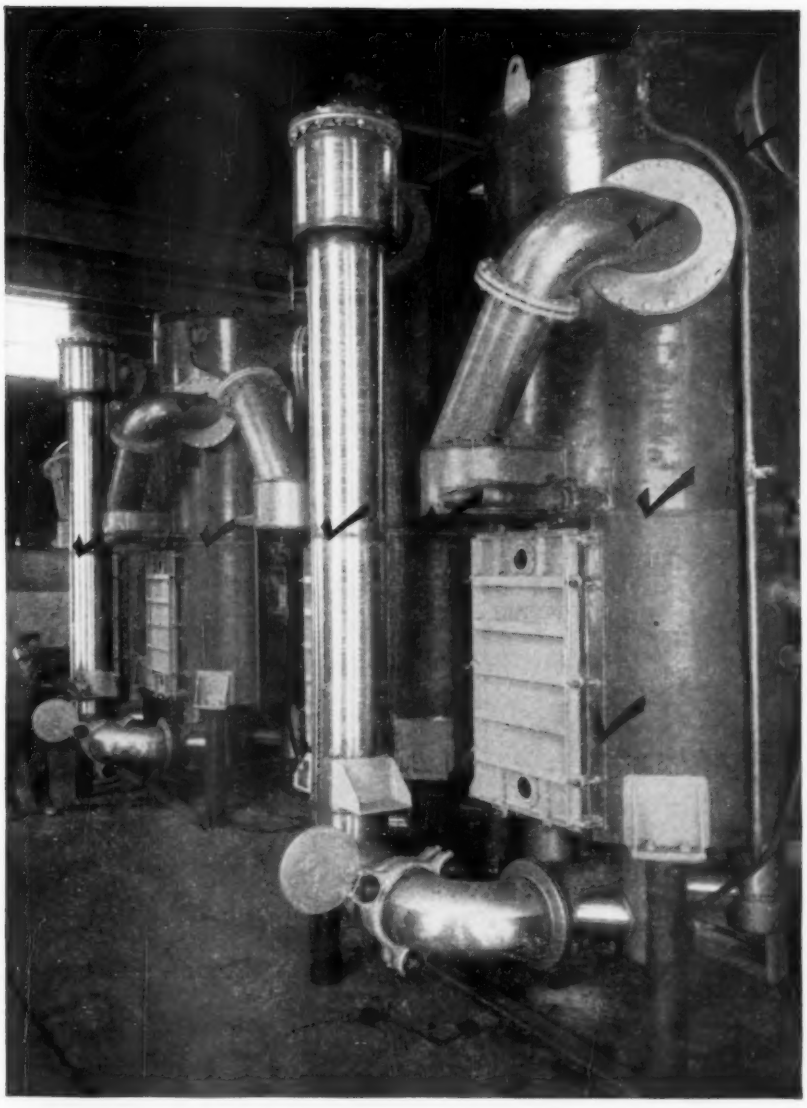
Temperatures on the flange vary from 250 to 300 F. Final camber cannot be measured until the beam has cooled thoroughly. Experience in setting torch speeds to give uniform rise increases percentage of beams successfully cambered on the initial run.

CLOSEUP of radiagraph unit during flame-cambering operation.

Asbestos Protection

An asbestos baffle is permanently mounted in front of the radiagraph control to protect it from heat. When in operation, however, an asbestos cloth is laid over the baffle and the radiagraph unit as further protection from heat and scale particles.

To provide a steady flow of completed beams, New York Shipbuilding spreads out a number of beams for cambering, and keeps the radiagraph unit in almost continuous use.



Maxim's 47,000-gallon-per-day sea water evaporators . . .

Inco Welding Electrodes put strength in the giants' joints!

Maxim built these two sea water stills almost entirely of Monel* nickel-copper alloy. Together, the giants turn out *up to 94,000 gallons* of fresh water a day!

A big welding job? It required nearly a ton of electrodes for the many joints between Monel alloy and itself . . . between it and steel.

An exacting job? It was *that*, too. For every one of the joints had to be strong and corrosion-resisting . . . to withstand pressure . . . to take the bite of boiling sea water.

Inco Welding Electrodes filled the bill. Maxim Silencer Company used "130" Monel* Electrode to join Monel alloy to itself . . . "140" Monel* electrode to join Monel alloy to steel. Almost 2,000 pounds of electrodes altogether! Not a bit of trouble was experienced on *any* of the welds.

When you join Inco Nickel Alloys to themselves or to other metals, be sure to use Inco Welding Products. That way you assure *customers* of long-lasting equipment. That way you assure *yourself* of customer satisfaction.

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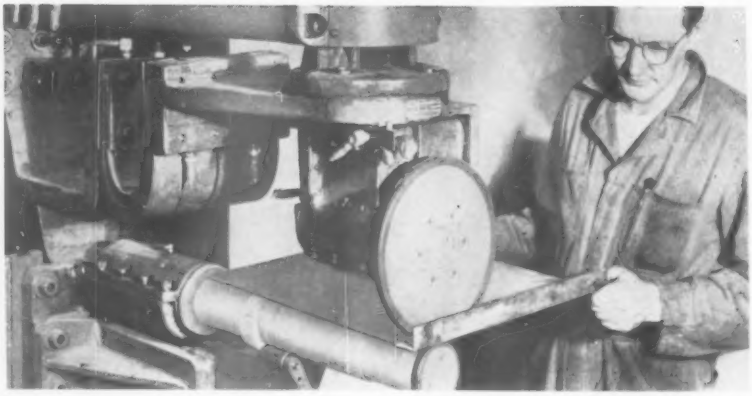


SEAM welding wheels and lower wheel shaft coated with liquid insulation to prevent short-circuiting. Brushing application allows touch-up of worn spots.

Paint-on material insulates welders

By a Staff Member

PRODUCTION welding tests during 1956 preceded commercial release of a new liquid insulation material for welding machines and equipment. Called "No-Short," it is produced by Lovell Chemical Co., Watertown, Mass.

Said to have one of the lowest dielectric factors among insulation coatings, the new product can be painted with a brush on resistance welding electrodes, holders, horns, arms and other machine parts to prevent short-circuits. Dried overnight, it reportedly forms a firm, chip-proof coating that has high wear resistance and bending strength.

With a dielectric constant of 7.5 at 1,000 cycles, the insulation material has a voltage breakdown of 1,000 volts on d-c. Although several coatings can be applied (two are recommended), a-c voltage breakdown with a single coat is as follows:

150kc—800v	*800kc—700v*
300kc—800v	*1mc—700v*
500kc—800v	*2mc—550v*

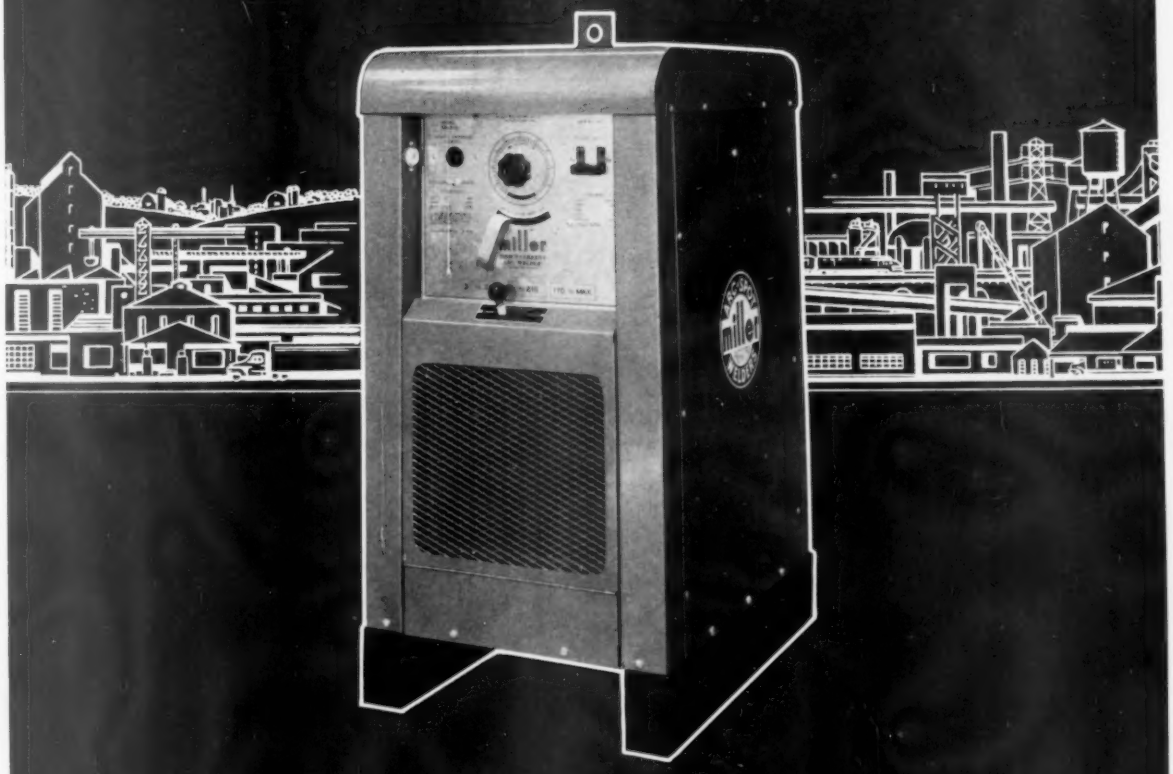
Ordinary welding heats are said to have little effect on the coating. Fast production work at temperatures of 550 F failed to diminish dielectric strength, but did decrease abrasion resistance.

The manufacturer has claimed successful application of "No-Short" on conductor metals and alloys other than those used in machine parts. Copper, steel, brass, silver and aluminum were insulated for tests.

The product, which is reportedly resistant to all acids, has a blue color which helps distinguish insulated materials. The material is also said to be non-toxic and non-allergy-producing.

PORTABLE spot welding gun used in auto body assembly was coated during production tests of insulation material. Common pits caused by shorting reportedly were eliminated.

"...if it's Miller you know it's the finest..."



Wherever industry exploits the greater profit possibilities of arc welding processes, Miller selenium rectifier type dc welders have earned re-order respect.

Adapted by design to widest range of specialized and automatic applications, the Miller SR series is offered in single or duplex models of from 200 to 1200 amperes with 60% duty cycle ratings. Lowboy units (27½" high) for stacking.

miller ELECTRIC MANUFACTURING CO., INC. APPLETON, WISCONSIN

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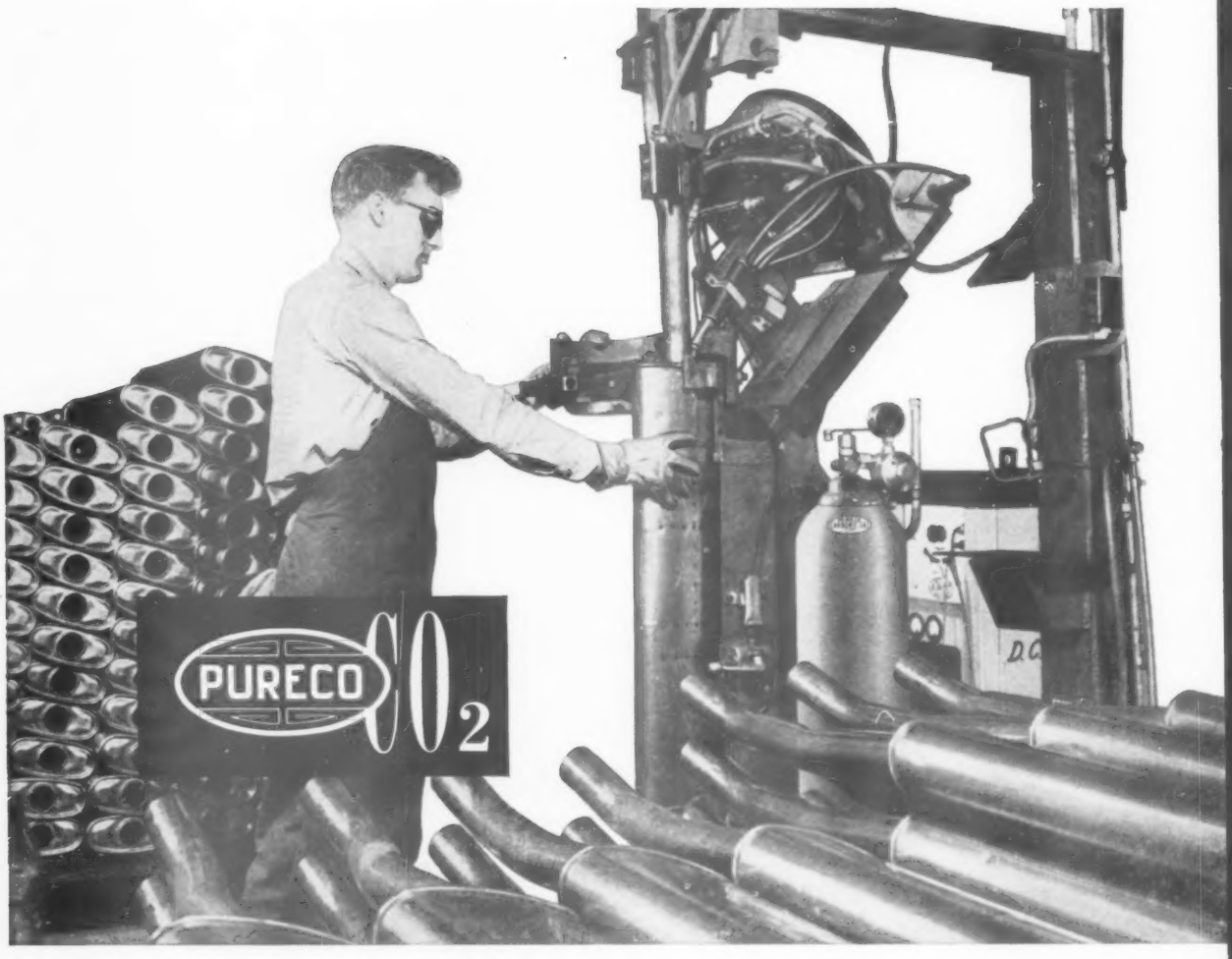

With Pureco CO_2, one man efficiently welds over 100 units per hour. The Walker-Michigan Company, Jackson, Michigan (a division of the Walker Manufacturing Company of Wisconsin), prominent metal fabricators, employ this shielding gas to produce economical welds more rapidly.

Low cost inert gas shield!

For certain welding operations CO_2 is proving *an ideal inert gas shield* — economically and productively.

Pure Carbonic Company supplies CO_2 in all forms — gas, liquid, solid — for hundreds of Industrial uses. Your Pureco salesman is prepared to give you the service you need to put CO_2 to work for you *profitably*. He is at your disposal.

PURECO

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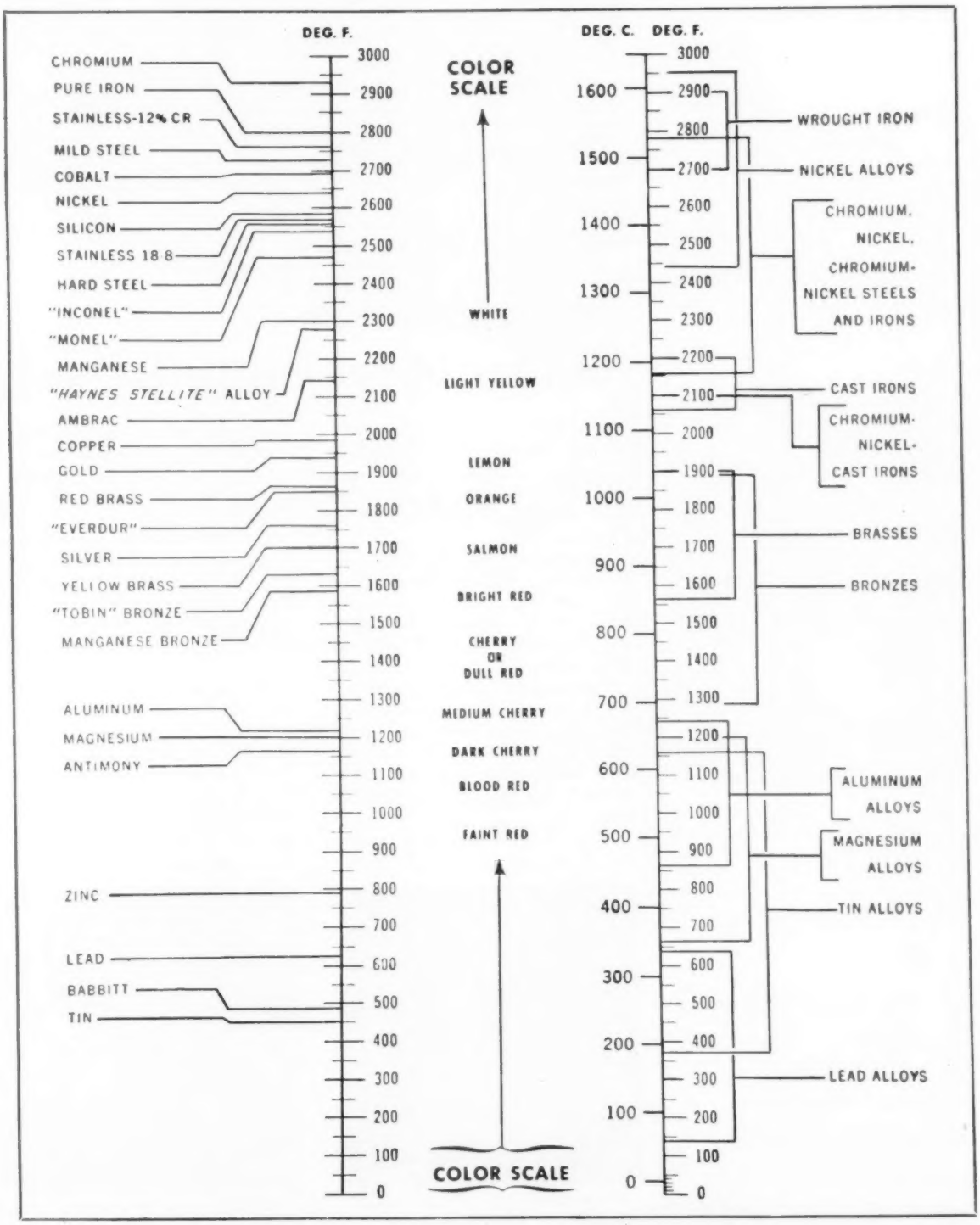
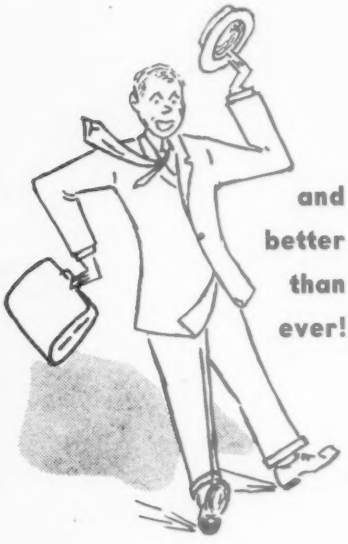
General Offices: 150 East 42nd Street, New York 17, N. Y.

Melting points and color scale for common metals and alloys



COMING JUNE 14th



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. . . 61% keep in desk drawer

. . . 21% keep in office file

. . . 18% keep in company library

WELDING INDUSTRY'S only ALL-YEAR 'round Buyers' Guide

—Courtesy Taylor-Winfield Corp.

WORKMAN operates 400-kva machine which can weld mounting brackets to shells of 14 different automobile bumper guards.

Versatile welder handles 14 set-ups

A WORKMAN who could perform 14 different tasks couldn't be thought of more highly than a projection welder currently doing the same thing for Eaton Mfg. Co. of Cleveland, Ohio.

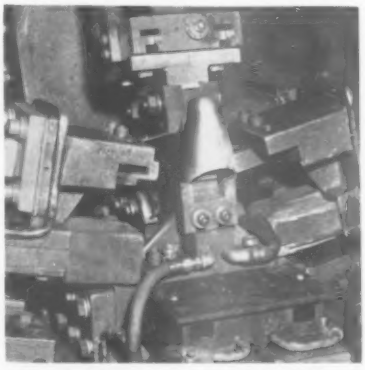
Designed to permit rapid die changeover, this 400-kva machine will weld mounting brackets to the shells of 14 different automobile bumper guards.

An average production rate of 290 assemblies is cited by Eaton's Stamping Division for those guards requiring more than one weld. Guard shells which take only one bracket—and are thus loaded faster—can be turned out at a rate of 325 assemblies per hour.

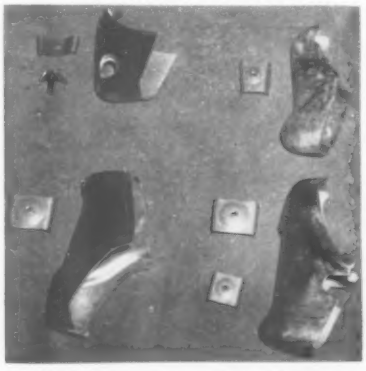
No parts cleaning is necessary for any of the guards welded by Eaton. The weld sequence is as follows: squeeze time, 30 cycles; weld, 15 cycles; hold, 20 cycles. Off time is equal to the time necessary to reload the machine.

Two 200-kva welding transformers provide the power for welding operations. Four welding heads, each capable of 2,300-lb maximum force, are mounted in T-slots to facilitate positioning adjustments during changeovers.

The machine's top clamping cylinder, which has an 8-in. diameter, gives a 400-lb force and has an adjustable 6-in. stroke. Two individual electronic controls provide independent control for the two welding transformers, firing in squence to minimize electrical power demand during welding.



WELDER tooling is fully adjustable for variety of assemblies.



TYPICAL bumper guards and mounting brackets handled by welder.

100% X-rayed...100% X-ray sound

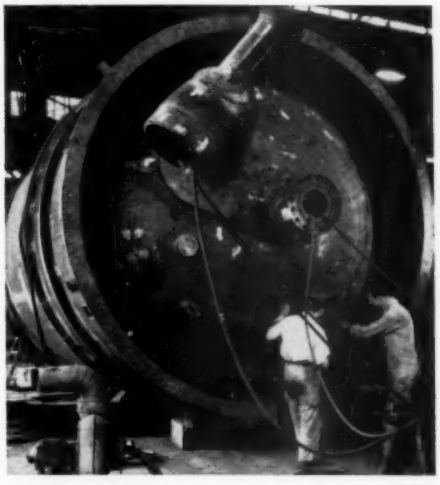
Welded with

ATOM•ARC 8016 CM

Welded by

Baldwin-Lima-Hamilton Corp.

Eddystone Division



Albert Imburgia, Welding Engineer, explains attachment welding detail on underside of reactor. Plate material is A301-54T-Gr. B firebox quality steel. Fittings are A 301-54T-Gr. B, A 335-53T-Gr. P12, A 182-53T-Gr. F12. Thicknesses ranged from 2-5/8" to 5-1/16".

100% X-ray sound with no rewelding is a common occurrence on Atom•Arc applications. It's also a common occurrence to find the country's leading fabricators switching to Atom•Arc electrodes for welding jobs involving mild and low alloy steels. One such company is the Baldwin-Lima-Hamilton Corp. of Eddystone, Penna.

Frank Iapalucci, Manager of Welding Engineering, and Carl Ascenzi, Chief Welding Engineer, have developed at Baldwin a quality control program for weldments that demands the ultimate in performance for every electrode used in their shops. Atom•Arc 8016 CM electrodes were their choice for all hand welds on this reactor for a large eastern refinery. The X-ray results proved their judgment sound.

Aside from the fact that no rewelding was required, the greater welding speed and easier operation of Atom•Arc electrodes were a great help in completing the job on schedule.

Atom•Arc electrodes will provide X-ray quality weld metal and greater joint efficiency, at a lower cost, on a wider range of ASTM steels than any other single group of electrodes. Atom•Arc electrodes are available in the following AWS grades: E7016, E7016 A-1, E8016 C-2, E8016 B-2, E9016 B-3, E10016 (1.70% Mn, .40% Mo), E12016 (1.9% Ni, .9% Mo, .2% V) and Atom•Arc T (E11016) for welding T 1 steel.

Find out how the savings and quality of Atom•Arc electrodes can benefit you. Contact your Alloy Rods Company distributor or write for informative data sheets.

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no finer electrodes made...anywhere

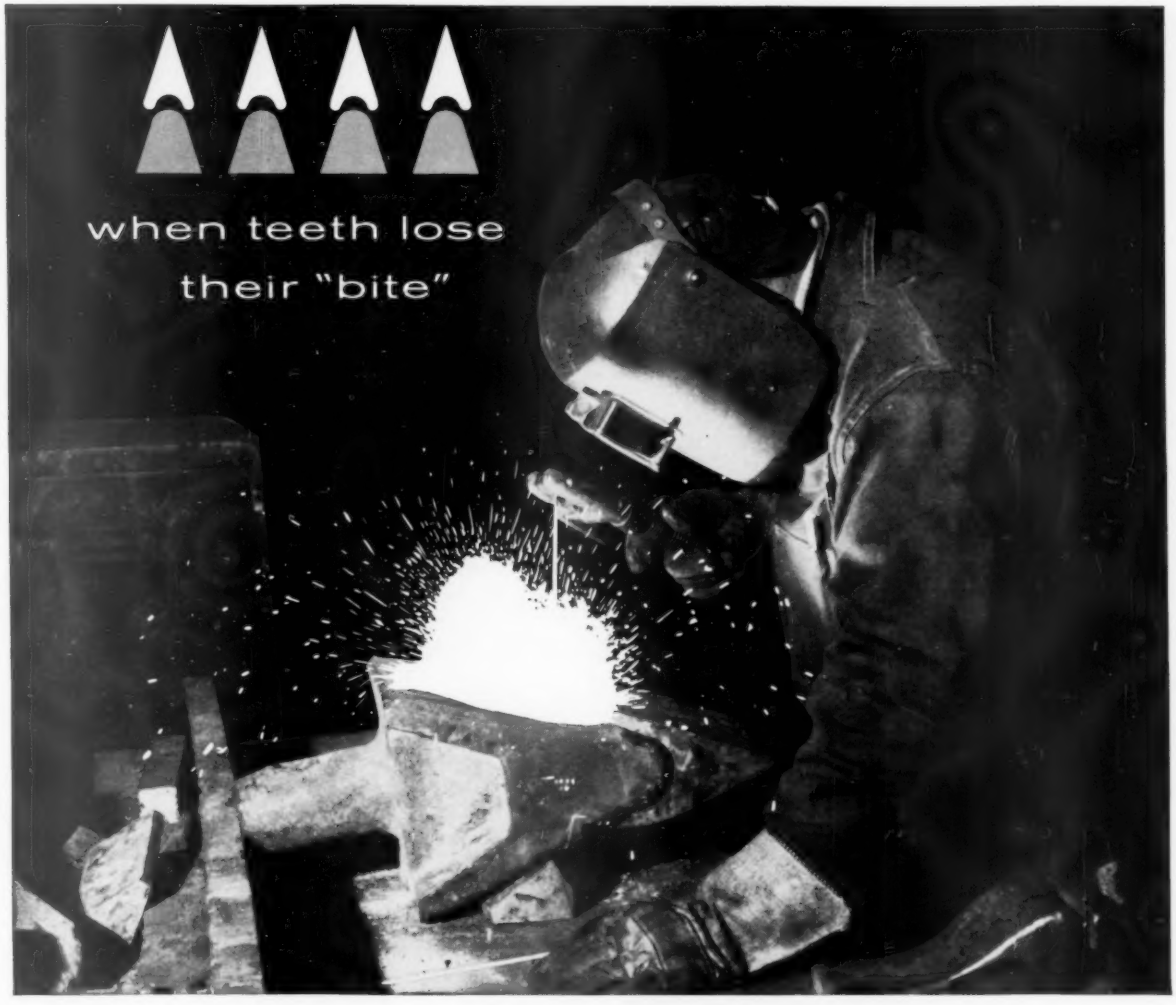
CONTINUOUS Mig welds are used on this aluminum tank shell. Aluminum alloy AA5086 (ASTM designation GM40A), produced in this instance by Kaiser Aluminum, was recently accepted by ASME for fabrication of unfired pressure vessels. It is highest-strength aluminum alloy accepted thus far by ASME for welded construction, and is said to provide 18% design advantage over next highest-strength alloy. Alloy's composition is 4% magnesium, 0.45% manganese, 0.10% chromium and the balance aluminum. Typical cross-section weld strengths are 37,000 psi tensile, 18,000 psi yield, and 13% elongation in 2 in.

On the job...

INSTALLATION of Taylor-Winfield hot upsetting resistance welders at U. S. Gypsum Co., Warren, Ohio, to join steel window frames and sash sections reportedly boosted frame and sash production 40% and cut labor costs in half. Operators place frame and sash parts in position, then actuate hot upsetters. Completed assemblies are removed and placed on overhead conveyor which takes them to finishing stations. One welder joins frames; other joins sash. Each pair then goes through finishing operations as a unit.

RECOGNIZING need for training of workers to catch up with industry needs, International Labor Organization lends helping hand to many countries. ILO expert impresses importance of using safety mask when welding to Haitian trainee. More than half of ILO's technical assistance activities are in vocational training field.

HEAD frame for foundry molding machine is welded with E6024 iron-powder electrodes of 3/16 in. diameter at Steel Fabricator Co., Cleveland, Ohio. Power source is a-c transformer welder; current setting for this particular application is usually around 275 amp. Heavy-duty positioner manipulates weldment. Head frame is fabricated mainly from ¾-in. mild-steel plate, but also includes some ½ and 2-in. material.



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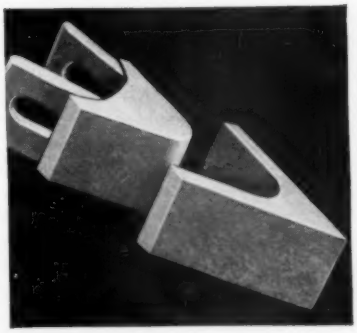
An average-size tooth can be completely rebuilt in about 15 minutes. The repointer overlaps the tooth top and bottom and is easily welded in place, using only a few electrodes.

Cast of Amsco Manganese Steel, with "ears" that protect the flat sides of the tooth, these repointers add strength and service life to the entire tooth. Available as individual repointer units, or in bar lengths.

For heavy digging, use Amsco "Wear-Sharp" Repointers or Repointer Bars. Order Amsco Repointers from your nearby Amsco Distributor.



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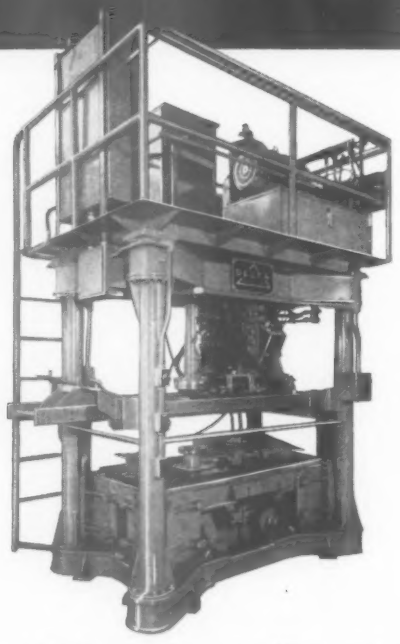

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—*A. M. Byers Co.*

WELDOR is shown at work on 5-in.-diameter section, first joined with 12-in. sleeves, then welded.

Welding Milwaukee's power line

CROSSING under the Milwaukee River at two locations, 7,200 ft of corrosion-resistant wrought iron pipe will carry high-voltage power from Wisconsin Electric Power Co. to Milwaukee's heavily industrialized south side.

Pipes were laid in river bottom trenches, with no protection other than backfill. The pipe had to have a high degree of corrosion resistance, plus good bending and welding qualities.

One river crossing was composed of six pipe sections, each 5 in. in diameter. The other crossing was made with nine similar-size sections. Many of the bundled pipes were towed into the river in two sections from opposite shores and welded on a barge in midstream. Twelve-inch wrought iron sleeves were used in joining.

To complete crossings, 60 vertical bends in the piping (some as great as 45 deg) were required. There were 24 horizontal bends. All bends were made without mechanical joints. It is hoped that welded installations of this type can be used in future crossings, eliminating buried armored cables.

Crescent acquires Lowell Wire

Crescent Co., Inc., Pawtucket, R. I., has acquired Lowell Insulated Wire Co., Lowell, Mass. Crescent Co. plans to expand its operation in field of insulated wire, cable.

WELDORS work on steel shell for vapor container. Part of turbine room is shown at right.

Container shell for atom reactor is arc-welded

FORT Belvoir, Va., will be the home of a vapor container for the Army package power reactor—one of the nation's first atomic generating plants.

In fabricating the vapor-container shell from steel ring segments, each seam was welded on both sides. Welds were X-rayed to assure uniform bond.

Expected to be in operation early in 1957, the APPR is being built for the Atomic Energy Commission by Alco Products, Inc., Schenectady, N. Y.

Designed to withstand maximum pressure which could be exerted should an incident occur, the container is 64 ft high and 36 ft in diameter. Its walls of 7/8-in. steel plates will be reinforced with 2 ft of concrete.

The steel shell for the vapor container was arc-welded with E6010 electrodes on d-c. A double-bevel parts preparation method was used. Electrodes used were 3/16 and 5/32-in. in diameter.

The Army package power reactor project is being built under the first fixed-price reactor contract awarded by the AEC.

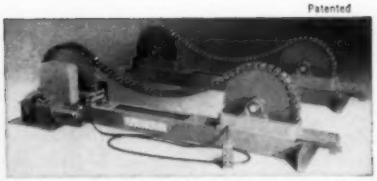
It is a 2,000-kw pressurized-water type plan designed so that components may be carried by air anywhere in the world, and assembled there to produce electrical energy through the atom.

The installation at Fort Belvoir will be used to train military personnel.

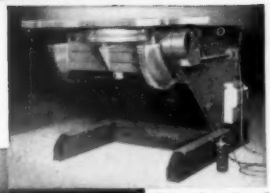
Aronson

Offers You Over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact Requirements

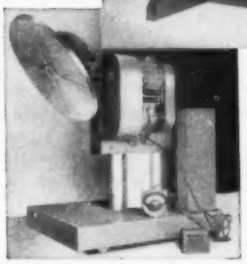
Patented



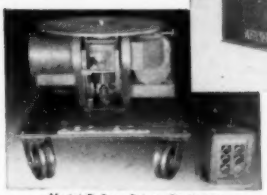
Aronson TracTred (T. M. Reg.) Turning Rolls for thin-walled heavy cylindrical work to 27 tons capacity. Zero to 100 IPM turning speed and Built-In Grounding.



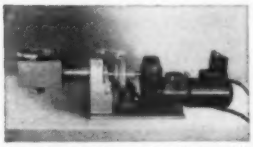
Heavy Duty Precision Built Rubber and Steel Tired Turning Rolls, 100% overload protected. Capacities to 250 Tons. Also Tilting Rolls, Pipe Rolls and Rail Cars.



Heavy Duty Gear Driven Positioners, with Magnetic Braking, Mercury Grounding, and Optional Speeds. Capacities to 24,000 lbs.



Heavy Duty Floor Turntables with precision speed control and Magnetic Braking, used for welding, burning, X-raying, etc. Capacities to 75,000 lbs., various heights and speeds.

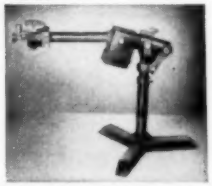


Fully Automatic Gear Driven Positioners, featuring Power Elevation, Tilting and Rotation. 5,000 lbs. Capacity.

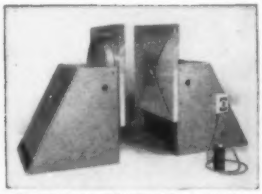
Model D Gear Driven Positioners, Compact, Precise, Rugged. Capacities to 1000 lbs.

Bench Turntable Automatic Positioners with Mercury Grounding Capacities to 500 lbs.

Patented



Aronson Universal Balance Positioners (T. M. Reg.) position your weldments effectively, instantly for downhand welding. Capacities to 2000 lbs.



Rugged Head and Tail Stock for positioning bulky weldments between centers. Table Backup for Zero Deflection. Magnetic Braking. Capacities to 160,000 lbs.

Aronson Twinner Permanent Magnetic Clamps, six models with thousands of uses in welding set-up work. Write for bulletin.

POSITIONEERING with Aronson

POSITIONERS

UNIVERSAL BALANCE® POSITIONERS
BENCH TURNTABLE POSITIONERS
GEAR DRIVEN POSITIONERS
HEADSTOCK-TAILSTOCK POSITIONERS
TRACTRED® TURNING ROLLS
RUBBER-TIRED TURNING ROLLS
RAIL CAR POSITIONERS • TURNTABLES
FULLY AUTOMATIC POSITIONERS
MAGNETIC WELDING CLAMPS

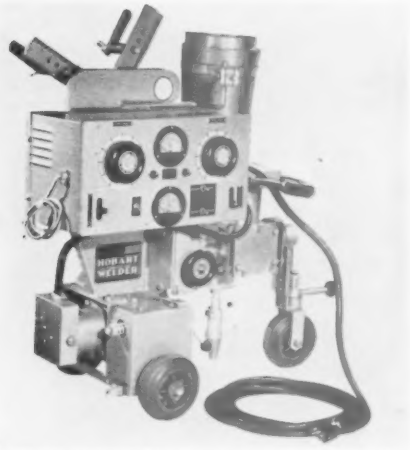
ARONSON offers you over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact requirements

Write for detailed engineering data

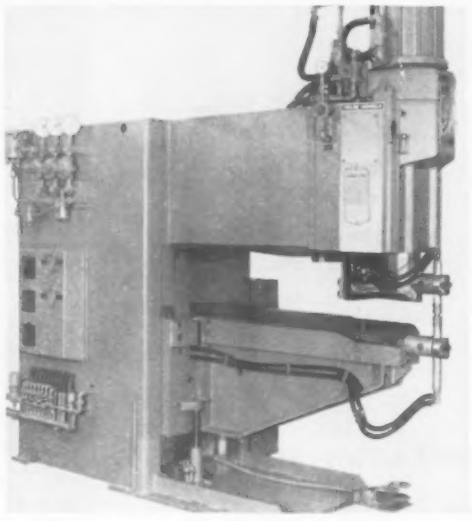
Quality POSITIONERS by Aronson MACHINE COMPANY
ARCADE, NEW YORK

new products

• • • USE CARD ON PAGE 113



FREE-WHEELING tractor mount, coupled with automatic submerged arc welding unit, gives ease of movement.



SPECIAL equipment can be added to RW press welder for specific job.

Automatic welding

AUTOMATIC, tractor-type, submerged arc welding unit is for long seams, straight or curved such as in shipbuilding, structural welding or welding of large tanks.

Unit will weld backward or forward—when locked in position for straight line seam; when maneuvered by operator on curved or irregular seam. Adjustable nozzle permits welding on flat butt or fillet joint.

Two models are available: "TSM-5D" embodies "ASM-5D" automatic submerged arc welding unit, with basic welding head, wire-feed motor, convenient controls, molded flux hopper wire reel, plus special tractor mounting (20 ft length of 6 conductor control cables is standard); "TSM-5H" is same as first model but has additional remote control of voltage. *Hobart Bros. Co.*

Circle No. 1.

Electrode

COMBINATION of the "EutecTrode 68 a-c" and "680 d-c" electrodes for low temperature use resulted in the new a-c/d-c electrode "680 a-c/d-c" for high alloy steels. The convenience of a-c/d-c operation with one electrode makes the "680 a-c/d-c" ideal, states the manufacturer, for use on dissimilar alloy steels, high tensile work, carbon, spring, tool and die steels.

This electrode produces austenitic matrix with ideal ferrite balance, states the manufacturer, which results in ultimate crack resistivity. The electrode is claimed ideal also for high strength, wear, impact and corrosion-resistant welds and overlays on all steels requiring highest possible properties.

Electrode is available in 3/32, 1/8, 5/32 and 3/16 in. diameters. It produces joints with an ultimate tensile strength to 120,000 psi. *Eutectic Welding Alloys Corp.*

Circle No. 2.

Welding flange

TAPER face, 125-lb, lightweight welding neck flange is for use where lighter schedule pipe must be connected to 125-lb cast-iron valves and other equipment. Tapered face causes greater pressure to be exerted near bore. This is said to end problems in getting leakproof seal. Also flange when equipped with full face gaskets can be bolted to cast iron or semi-steel flanges.

Joint can withstand three times more pressure with taper. Flange is rated at 125 lb for water, oil and gas. Available in 1-12 in. sizes, bored to match 0.188 in. and 0.250 in. wall pipe, in sizes 4-12 in., within 3/32 in. mismatch permitted by pressure piping code. *Tube Turns.*

Circle No. 3.

RW press welder

PREVIOUSLY available only as special welder, type "EQB" resistance press welder is now available as standard model. Various styles of size 3½ welder are equipped with modified tooling for specific welding requirements. The 250 or 450-kva single phase transformers or "Tri-phase" power packs supply current.

Maximum welding force rating is 7,500-12,000 lb. It is designed for hydraulic or compressed air operation. An 8-step transformer tap switch provides secondary voltage and welding current adjustment. Optional are mechanisms for electrode cleaning, die alignment. *The Taylor-Winfield Corp.*

Circle No. 4.

E6013 electrode

GENERAL purpose electrode is E6013 type. The "90B" is heavily coated electrode of moderate arc force designed to operate in all positions, a-c/d-c. It is recommended for welding mild steel to medium carbon and low alloy steels. *Air Reduction Sales Co.*

Circle No. 5.

Regulator

HIGH capacity pressure regulator is for air, gases and liquids. The ¼ in. pipe size is only 2 3/16 in. in diameter and 3⅝ in. high. Regulator employs direct diaphragm-operated valve. Designated "HC" type, there is a self-relieving model venting to atmosphere for air only. *Generant Engineering Co.*

Circle No. 6.

With rebuilt General Electric ignitrons you get . . .

ALL-NEW CATHODE ASSEMBLY

Brand-new cathode unit is supplied for each remanufactured G-E ignitron regardless of used-tube condition. Cathode parts get heavy wear, and are most likely to fail after long, hard service.

NEW IGNITOR

NEW MERCURY SUPPLY

STABILIZED-STEEL WATER JACKETS! ONLY G-E IGNITRONS HAVE THEM.

High-quality stabilized stainless steel for water jackets is the reason General Electric ignitrons can be rebuilt. Stabilized steel alone can undergo a second intense baking with no after-corrosion.

General Electric welding ignitrons have two lives . . . can be rebuilt, save 28% on replacements!

INSTALL General Electric welding ignitrons throughout your plant and you can reduce tube replacement expense by almost one-third. Because G-E ignitrons can be rebuilt to give a second complete service life . . . for 28% less money than new tubes cost.

When General Electric ignitrons near or reach end of life, hand them over to your G-E tube distributor. For each used General Electric tube, he will supply one completely rebuilt ignitron at savings in the range of $17.90 to $63, depending on size of the tube you exchange.

Rebuilt ignitrons last as long as new tubes, give the same dependable performance. They are factory-tested to meet new-tube requirements . . . carry the standard G-E ignitron warranty.

Thousands of dollars can be saved yearly when you install General Electric welding ignitrons—new and remanufactured. To accurately chart your potential savings in the year ahead, see your G-E tube distributor! He has all the necessary facts. *Electronic Components Division, General Electric Company, Schenectady 5, New York.*

"Power Tubes for Industry and Broadcast". ETX-10J. An up-to-date guide to characteristics and warranties for all G-E transmitting and other power tubes. Ask your G-E tube distributor for your free copy, or fill out and mail the coupon at right!

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General Electric Company
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Schenectady 5, New York

Please send free of charge, "Power Tubes for Industry and Broadcast", ETX-10J to:

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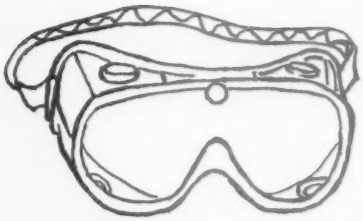


Weldor's goggle

COMFORTABLE "Softsides" goggle offers full vision. Soft vinyl frame molds to face, giving snug fit, even over prescription glasses. Lens is replaceable. Headbands are also replaceable.

Several models are available: "550" for general industrial use, perforations give ventilation; "551" for chemical and splash, hooded and screened vents for ventilation; "552" is gasproof, no ventilation, stainless steel fastenings, molded rubber headbands; "553" has screened ventilation, screened (not hooded) vents for free circulation with filter protection from chips, dust. Various lenses are available, also special positioning of vents. *H. L. Bouton Co.*

Circle No. 7.

Grinding wheel

GRINDING wheel now has "IL" bond which acts as internal lubricant, increasing abrasive cutting action of resinoid bonded wheels, states the manufacturer. Special chemicals and compounds have been added to the resinoid bonds which act as lubricant. The new bond is available with the "Red Streak" flanges for heavy duty snagging. *Simonds Abrasive Co.*

Circle No. 8.

Head and tailstocks

HEAD and tailstocks are for welding and assembly. They are of steel, heavyduty welded construction. Electrical components are enclosed and protected with 110-volt pushbutton stations. Designed for turning large frames and heavy structures, distance between headstock and tailstock can be easily adjusted to meet exacting job size requirements.

Headstocks are power-driven units, with constant speed drive and remote pushbutton motor control. Tailstocks are similar in construction, except they are not equipped with power drive. *Worthington Corp.*

Circle No. 9.

Dust collector

THE "123" dust collector, cabinet-type, is for heavyduty continuous grinding and other high dust volume sources. Handling as many as 8 grinding wheels at a time, model has storage capacity of 10 cu ft and filter area of 300 sq ft. Its 5-hp motor moves approximately 2,000 cu ft of air per minute, through 8 in. inlet. Cloth filters chemically treated for spark resistance are sealed against leakage. *Torit Mfg. Co.*

Circle No. 10.

E6010 electrode

IRON powder electrode represents an improved electrode of E6010 type. Designated "Murex Speedex R," new electrode is recommended for field construction, pipe line welding, shipyard applications, tanks, fired and unfired pressure vessels.

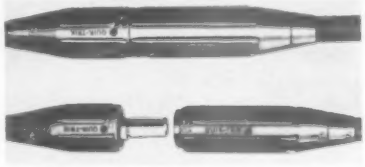
Electrode is claimed especially suitable for welds on machinery parts and many low alloy high tensile steels to ¼ in. thick. The deposit is said to be fast freezing; it wets and spreads readily. *Metal & Thermit Corp.*

Circle No. 11.

Torch guide

OXYACETYLENE cutting torch guide is of hardened steel. The tip nut of torch glides along guide frame. Light pressure only required of torch hand to maintain contact. Other hand holds guide steady in relation to desired line of cut. Guide is adjustable to accommodate flame size or tip length. It is recommended for beveling plate edges. Patent will be made available for either licensing or sale. Inventor will answer inquiries from interested manufacturers. *S. S. Miner.*

Circle No. 12.

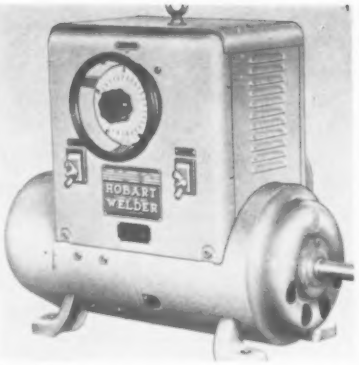


Cable connector

NEW Neoprene rubber insulators, strongly built around steel sleeves, have tapered ends to stretch over welding cable snugly. The "Quik-Trik" cable connector, mentioned in December WeldWorld, is economical to install. No capital equipment needed, states the manufacturer, no time consuming vulcanizing. Loosen an Allen screw, slide off insulator, slip over cable end. Connect cable as usual, slide back insulator, tighten.

Model "2/0-R" takes cables 1/0 and 2/0, with mechanical, soldered or brazed connections. Model "4/0-R" takes cables 3/0, 4/0, solder or brazed connections only. *Jackson Products.*

Circle No. 13.



Welder generator

GENERATOR only (less engine) of a 250 amp air-cooled gasoline engine driven arc welder is now available to those who wish to build own welder. Generator can be operated by direct coupling to a gasoline engine, or through V-belts and grooved pulleys connected to electric motor, gasoline engine, or PTO of tractor, truck, etc.

Control panel on generator front has multi-range dual control switch, with 5 main ranges of welding current and 100 steps of volt-amp adjustment in each range, making 500 combinations of open circuit voltage and welding current.

Power required to drive generator at 2,200 rpm is 23 bhp gasoline engine (direct) or 10 hp electric motor (belted). Generator is 30 in. long, 18 in. wide, 25 in. high, weighs 300 lb. *Hobart Bros. Co.*

Circle No. 14.

Abrasive spheres

BARREL finishing media are "Tumblex S" abrasive spheres. Spheres come in five different diameters, are made of "Alundum" aluminum oxide abrasive. Spheres are ideal for barrel finishing, hard-to-contact recesses or intricate shapes. Spheres are dense and long lasting, states manufacturer. Manufacturers with parts suitable for finishing with new abrasive spheres may send samples to sample processing laboratory in Worcester, Mass. *Norton Co.*

Circle No. 15.

Metal door welder

SUSPENSION type spot welder is for welding end channels to outer skin of hollow metal doors. Welding head consists of three electrodes, two outer electrodes alternately making contact with outer skin as middle electrode contacts first one side of channel and then the other. Welder is air-operated, water-cooled, 30 kva type. Controls are wall-mounted. Weighs 200 lb. *Larkin Welder & Machine Corp.*

Circle No. 16.

Rugged simplicity for industrial gas flow control

The New
K-G FLOWMETER REGULATOR

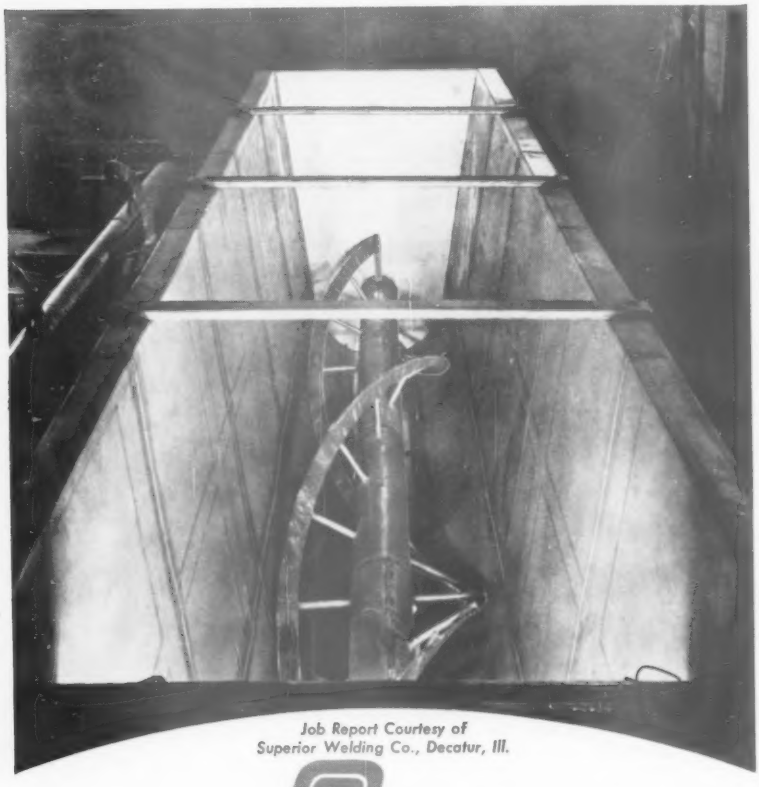
Designed to give you accurate volume control of your shielding gas . . . yet provide ruggedness to withstand more than normal abuse on the job.

Result: New simplicity, greater gas control efficiency . . . when you specify K-G.

Order now . . . your K-G distributor is at your service. Call him, or write K-G for complete information.

the K-G **equipment company, inc.**
a unit of Air Products, Inc.
PO Box 538 Allentown, Penna.

How to get longer service from stainless welded equipment



Job Report Courtesy of
Superior Welding Co., Decatur, Ill.

WELD WITH ARCOS

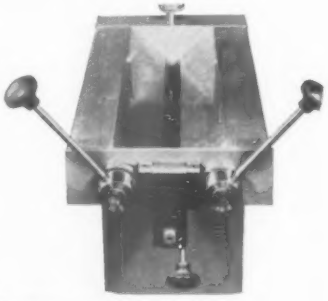
STAINLESS ELECTRODES

Processing certain foods in equipment such as this corn germ separator often releases acid by-products. These by-products, although weak, often corrode the equipment and contaminate the food unless the equipment is made of the "right" stainless. For welding the trough and agitator sections, two types of ARCOS Electrodes were used—Chromend KMo and Chromend 25/20 Mo respectively. These electrodes meet all the essentials: trouble-free welding, unbroken weld performance in service, and freedom from contamination. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

SINGLE eye-piece goggle has picture window for wide vision. The "Solo goggle" fits standard 2x4¼ in. filter lenses and cover glass. Available with head rest for close fit or for ventilated off-the-face wear. Headband has wide range adjustment. ***The Fibre-Metal Products Co.***
Circle No. 17.

Grinding wheels

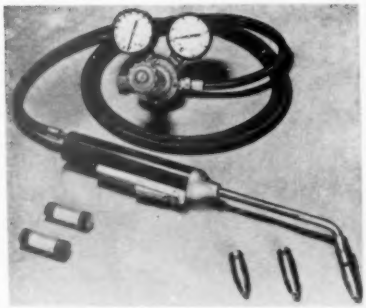
GRINDING wheels are reinforced with strong fabric, bonded with resins. These "Duraflex" wheels have depressed center. Recommended for rough grinding, reducing heavy welds, undercutting and notching. Made in special sizes also. Can be used as cut-off wheels. *American Emery Wheel Works.*
Circle No. 18.



Seam welder

LONGITUDINAL seam welder, series "B", is for longitudinal seams on cylinders, flat sheets, manual or automatic operation. Clamping action on seam is performed manually, can be operated independently. Hand-operated eccentric cams provide downward pressure against arched-spring clamping arms. These force holddown clamps against work.

Lower horn serves as back-up bar. It rotates so that different back-up bars can be used interchangeably. All models will handle work as small as 3 in. in diameter and as large as 30 in. diameter. Machine is available in floor and bench models, in three sizes and three lengths, 18, 24, and 30 in., respectively. *The Webb Corp.*
Circle No. 19.



Acetylene torch

ACETYLENE torch lights automatically when operator presses control lever, shuts off when not in use. The "Torch-O-Matic" lights from battery-powered ignition. Torch can be used in brazing, heating, soldering, sweating. The 12-oz torch provides flame temperature of approximately 3,000 F. Stem of torch is angled for flexibility in directing flame. *Velocity Power Tool Co.*

Circle No. 20.

Metallizing

METAL powder is for rebuilding engine and compressor crankshafts by metallizing. Designated "Colmonoy C-250", powder is high chromium-nickel powder containing chromium borides. It is said to have low coefficient of friction, controlled surface porosity and good oil retention properties.

Powder is recommended for use in following: reclamation of worn or scored crankshafts; modification of crankshafts used in racing cars; salvage of crankshafts used in marine engines, compressor crankshafts. *Wall Colmonoy Corp.*

Circle No. 21.

Protective cap

SKULL cap is for use in close quarters where head bumps and lacerations are a problem. Known as "No. 75," metal cap is lightweight. Elastic band worn low on back of neck adjusts cap size. Sweatband is padded, removable. *The Boyer-Campbell Co.*

Circle No. 22.

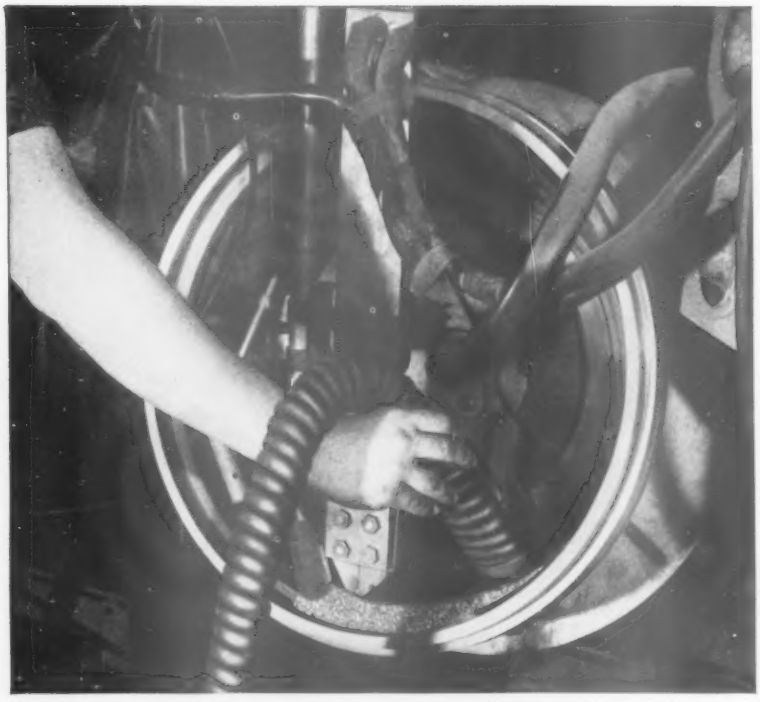
More proof . . . how to get consistent results from submerged arc welding

Courtesy of CF Braun & Co
Engineers and Constructors, Alhambra, California

WELD WITH ARCOS

STAINLESS COILED WIRE

Unfailing strength and resistance to corrosion at elevated temperatures are vital in the welds of this massive 14 ft. diameter, 30 ft. long catalyst pressure vessel. All seam welding of the 1¼ Chrome ½% Moly plate was submerged arc welded with Arcos Chromar *welding quality* wire. Arcos Chromar wire—like every Arcos filler metal product—can be used with confidence on the most critical jobs. Start with Arcos and be sure of uniform dependable weld metal—from start to finish. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



INVINCIBLE

Welding Flux Recovery Units Quickly Pay for Themselves!

The American Welding and Manufacturing Company, Warren, Ohio, has used Invincible units for several years along with their submerged arc welders. They report that:

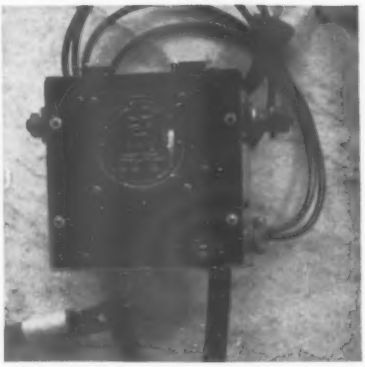
1. The Invincibles recover *all* the unfused flux for re-use.
2. The quality of recovered flux is high for Invincibles return only slag-free, usable material to the hopper of the welder.
3. The operator removes unfused flux from area of weld so he can concentrate entirely on his work.

Model 490 designed especially for use with portable welding equipment.

Two machines used by this manufacturer salvage about 100 lbs. of material daily. So, within a few months the value of the flux recovered was equal to the price of the Invincibles. Since then, they have made important savings while giving trouble-free service.

WRITE FOR FOLDER on all types of Flux Recovery Systems.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO



Arc timer

ARC "Tim-O-Weld" timer records actual arc time elapsed during welding. While electrode is melted and arc is present, running time meter records in tenths of hours. When arc is shorted, either to start a new arc or in an attempt to beat the system, clock stops. Timer reduces calculations for joints, rods and positions. Timer is connected directly to output of generator. Electrodes are terminated at timer. Alternating current source is required to power recording device which is equipped with reset feature on standard model. *The First Electronics Corp.*

Circle No. 23.

Cylindrical grinder

CYLINDRICAL grinding machine is for precision grinding of large, relatively light workpieces. The 30 in. type "LCTU" semiautomatic grinder is available in work lengths of 48, 72, and 96 in. and will handle work up to 30 in. in diameter.

Wide tables and ways are built into machine for support. Automatic or manual wheel feed settings are speeded through "click-count" wheel feed index. Automatic cycle is actuated with single lever and terminates either manually or by an electrically timed control. Jogging lever permits fractional rotation of work. Grinder also has pre-set table truing and grinding speed control. Optional accessories include locating devices, automatic wheel truing, lever-operated device for moving wheel into shoulder to be ground. *Norton Co.*

Circle No. 24.

Filter, regulator

LINE of filters, regulators and lubricators, known as the "Crown" line, are designed for use in compressed air lines. Units are of modern design and simplified construction, offering many advantages to users of air cylinders, air presses and air tools. *Hannifin Corp.*

Circle No. 25.

ORIGINAL
Low Temperature
EUTECTIC
WELDING ALLOYS

Plant, Research Laboratories, World Headquarters

Eutectic Welding Alloys Corporation are the inventors, patentees, and only manufacturers of Eutectic "Low Temperature Welding Alloys"® that minimize or completely eliminate the warping, distortion, stress, and embrittlement caused by conventional high heat welding materials. Accept only genuine Eutectic "Low Temperature Welding Alloys."®

How good is "EUTECTIC" service to industry?

IN 1955 AND AGAIN IN 1956... "EUTECTIC" DISTRICT ENGINEERS WON TOP HONORS FOR THE WELDING INDUSTRY

Victor J. Lyons (Left)
1956 United States
Victor Trophy Winner

Oliver Lehtela (Right)
1956 Canadian
Victor Trophy Winner

Winners of the Victor Trophy presented by the National Sales Executives Club are chosen for exceptional ability to serve industry. For the Welding industry, in 1955 and again in 1956, Victor Trophies were awarded only to "Eutectic" District Engineers.

Outstanding service to industry by "Eutectic" is no accident. Over 15 years ago, "Eutectic" pioneered the organization of a nation-wide team of welding specialists, factory trained in advanced welding techniques, completely familiar with the welding procedures of different industries. Today, over 350 "Eutectic" District Engineers serve shops and plants throughout the United States and Canada. Using their specialized knowledge to solve production, maintenance, and salvage welding problems, they save industry time, materials, and labor. Users of 5 lbs or 5000 lbs of welding alloys receive the same obligation-free "Eutectic" service, merely by phoning their "Eutectic" District Engineer. "Eutectic" service has always meant — Better Service and Greater Savings for Industry.

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Jean Paul Gagnon
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Another example of Eutectic's pioneering service to industry, Eutectic Warehouse-Service centers are located in principal cities throughout the country. They bring Eutectic's Flushing, N.Y. headquarters directly to industry by serving as local sources of free technical information and providing fast shipment of oven-fresh Eutectic "Low Temperature Welding Alloys.®" Warehouse-Service Centers are also local headquarters for Eutectic District Engineers, ready to bring industry first hand answers to its welding problems and show why Eutectic "Low Temperature Welding Alloys®" mean greater weld savings.
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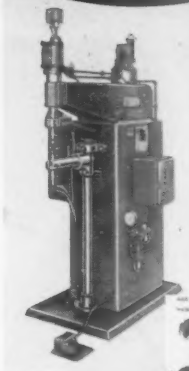


Eisler
Spot Welder
No. 250-VDAS

Eisler
Indexing Turntable
No. 88-GT-8

Eisler designs and manufactures spot welders from 1 KVA as well as a complete range of butt, saw and band welders and other welding equipment, including indexing turntables — standard, or to your order, electric or gas soldering and brazing machines.

Write today without obligation!

EISLER ENGINEERING CO., INC.
Charles Eisler Jr., President
749 SO. 13TH ST., NEWARK 3, N. J.

Electrode

Low hydrogen, iron powder electrode is termed "Jetweld LH-70." An all position electrode, it is for general purpose welding of steels with high currents and for welding crack-sensitive steels and steels tending to produce porosity in weld metal. Typical uses are for welding low alloy steels which must be welded without preheat, high sulphur-free machining steels, steels to be enameled, medium to high carbon steels and thick sections.

Bead appearance is smooth and clean. Either drag or short arc technique can be used. Electrode is classified as AWS E6016 but it also meets requirements of classes E6015, E7015, and E7016. It is available in 1/8, 5/32, 3/16, 7/32, and 1/4 in. *The Lincoln Electric Co.*

Circle No. 26.

Eye shield

NEW model of "Magic" eye shield has flexible arm making it especially suited for use on tool grinders, large lathes and other machinery where mounting location is not close to work. Flexible arm is 12 in. long.

Unit incorporates 10 by 12 in. shield and 45-lb life permanent magnet base. Shield also available with permanent mounting fixture. *Standard Portable Cord Co., Inc.*

Circle No. 27.

Drill press

AUTOMATIC power feed is feature of electromagnetic drill press. While electromagnetic base holds press in position, new power feed allows operator to run drill point down to center punch mark, turn on automatic feed and let drill do the work. Feed can be engaged or disengaged at any time, depth of cut per revolution can be set according to drill bit size. *Portomag, Inc.*

Circle No. 28.

Ultrasonic cleaner

SMALL compact ultrasonic unit is designed for bench-top cleaning operations. The "AP-10-B" comprises a 36-40 kc/sec power generator and cylindrical cleaning tank, with transducers hermetically sealed into the base. Tanks are of 1-pint, 1-qt or 1/2-gal capacity giving cleaning area of 18 sq in. Cleaning is effected by ultrasonic activation of the solvent. *Branson Ultrasonic Corp.*

Circle No. 29.

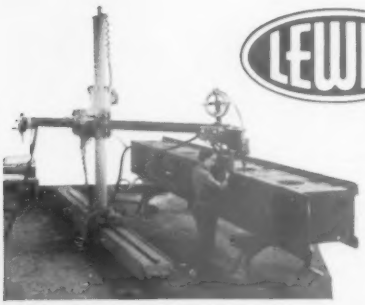
7391-LWE

ONLY THE
LEWIS "UNIVERSAL"
GIVES YOU MACHINE TOOL ACCURACY
FOR EVERY AUTOMATIC WELDING JOB

For precision welding . . . plus portability . . . none can equal the LEWIS automatic welding head manipulator. Heavy-duty design and construction . . . machined and hardened ways . . . make the "Universal" both machine tool accurate and portable.

Once a "Universal" is positioned . . . a quick, easy job . . . it operates accurately and consistently. It releases valuable production floor space ordinarily consumed by a fixed installation. In addition, it will accommodate any standard submerged arc or inert gas-shielded arc welding head.

Machine tool construction and precision . . . complete adjustability . . . and ready portability are standard features available only in the LEWIS "Universal".



LEWIS

Write for Bulletin 6960 for details and prices

THE LEWIS WELDING & ENGINEERING CORP.
WELDING DIVISION 77 Interstate Street • Bedford, Ohio

Resistance heater

RESISTANCE heater "RTR6" is designed for multiple small tube heating for 1½ to 2¾ in. Heating is accomplished by formed elements, regulated from the heater. A controlling unit can be used with a pyrometer controlling unit to regulate the heating of six welds, simultaneously.

Unit is designed so that the equipment can be used with 220, 440 or 550 volt power supply, single phase, 60 cycle, with simple link changes for any of the voltages. For stress relieving on all tubing below 3 in., the regulator is all that is required. Unit can also be employed to supply regulated power for resistance heaters, and for installing or removing special alloy steel bolts on high pressure turbines. *Electric Arc, Inc.*

Circle No. 30.

Brazing alloy

SERIES of four high-nickel content brazing alloys are for high temperature and corrosion-resistant service. Termed "Handy Hi-Temp" alloys, they are especially suited for brazing austenitic stainless steel, high-nickel heat-resistant and precipitation-hardening alloys. They are all useful for brazing carbon steel, non-ferrous metals with melting points above 1,850 F.

Designations—"Handy Hi-Temp 93," "91," "82" and "72"—are based on approximate nickel content. Alloys are available as cast rod, powder, fabricated and sintered from the powder.

Alloys are self-fluxing when used in controlled atmosphere of dry hydrogen, argon or helium. Can also be brazed in atmospheres of exothermic or endothermic gases and in air, with addition of flux. Standard brazing furnaces and salt baths operating at 2,150 F may be used for brazing.

Feature of alloys is that they actually alloy with base metals during brazing cycle. As a result, joints can be exposed to temperatures higher than original brazing temperature. The four alloys have flow points in range of 1,825-1,925 F. *Handy & Harman.*

Circle No. 31.

Timer

IMPROVED type "ET" electronic timer will control timed operations between 60 milliseconds and 60 seconds and is adjustable to any fraction of this range. It has readily accessible terminals, isolated load contacts and large, easy-to-read dial. It is available in two sizes. *General Control Co.*

Circle No. 32.

INTERMITTENT PASS used in hardsurfacing sprocket reduces rebuilding time and alleviates grinding by sand and mud.

TRACTOR IDLER shows herring-bone pattern of hardsurfacing created by intermittent pass. Grind and wear is reduced by this method.

Welder develops hardsurfacing shortcut using RANITE and intermittent pass

IN LOOKING for a more economical and quicker way to hardsurface tractor sprockets and idlers, Welding Foreman Art Powell of the L. E. Webb Construction Co., Inc., Santa Maria, Calif., hit on the idea of applying Ranite metallic coated hardsurfacing materials with an intermittent pass. In using this technique Powell lays down alternating beads with a gap between.

After trying other methods, Powell found this combination required less rebuilding time and at the same time effected a substantial dollar saving on each job.

Tractors of the Webb Construction Co. operate in both loose sand and mud with parts subject to continual heavy abrasion. When an intermittent pass is used on sprockets and idlers, resulting gaps formed between beads provide escape channels for the sand and mud, reducing grind and wear on these parts.

ART POWELL, welding foreman for L. E. Webb Construction Co., Inc., long-time Ranite user, combined Ranite with intermittent pass to reduce hardsurfacing time.

Although the Webb Construction Co. has been a Ranite user for more than two years, this is the first time Ranite was used for tractor maintenance and applied with an intermittent pass. Both Ranite "A" 3/16 and "B" 3/16 are being used for this purpose. Ranite was selected for its fast deposition rate, its resulting smooth weld bead and because it will not work harden.

Prior to shifting to Ranite, rollers were either sent out for rebuilding by automatic or were replaced with new ones. Actual savings now produced by using Ranite over automatic is $6 per roller with savings on sprockets and idlers totalling more than half previous costs. In addition, Webb Construction Co. has reduced actual hardsurfacing time by 50 per cent with the Ranite and intermittent pass combination.

Original parts used by them have a normal life expectancy of between 2000 and 3000 hours. Indications of Ranite hardsurfaced parts checked at 1000 hours of use are that the service span will be increased as much as three times.

Ranite, manufactured by Rankin Manufacturing Co., is the original metallic coated hardsurfacing rod in use throughout industry since 1938. It is made in several grades with a rod available to fit any hardsurfacing job. Toughness in proper relation to hardness is the answer to any wear problem and Ranite is alloyed on this principle with each grade being proportioned to give maximum wear for the job it is designed to do.

Cut your hardsurfacing time and costs now by shifting to Ranite. There's a Ranite rod for your particular application. For further information see your Ranite distributor or write to

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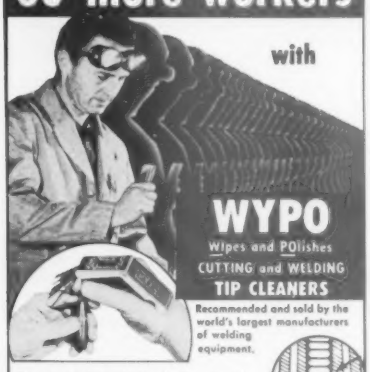
60 more workers



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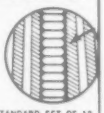
TIP CLEANERS

Recommended and sold by the world's largest manufacturers of welding equipment.



The exclusive circle design found only in Wypo Cutting and Welding Tip Cleaners provides as many as 60 more cleaning edges per inch of cleaner. Straight sided valleys, another outstanding feature of Wypo Tip Cleaners, insure a thorough cleaning and removal of all waste.

STANDARD SET OF 12 Cleans 27 Drill Sizes Nos. 75 to 45 incl.
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MASTER SET OF 21 Cleans 46 Drill Sizes Nos. 75 to 30 incl.

DOUBLE THE LIFE OF YOUR WELDING AND CUTTING TIPS

Fast, easy cleaning without jamming, scratching or enlarging the tip port means added years of service to your welding and cutting tips. Only with Wypo Tip Cleaners do you get thorough cleaning and polishing with one quick, easy motion. Wypo Tip Cleaners are specified for all types of welding cleaning jobs by the U.S. Navy, leading railroads, oil companies, steel mills, ship yards and industrial plants. Packed in a handy metal container. Buy Wypo Tip Cleaners at your welding supply dealer today.

WYPO

U.S. Patent No. 2,429,581 In Canada 1948

MAITLEN AND BENSON, INC.
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NEWS . . . . . *from page 6*

tion with the Fifth Welding & Allied Industry Exposition in Philadelphia, April 8-12. A total of 13 sessions are planned for the five-day meeting.

Attendance at the annual Spring meeting is expected to exceed 10,000 persons. A group of 94 speakers will address the meeting. The annual Adams Lecture will be delivered by DeWitt C. Smith, chief metallurgist, electrode division, Harnischfeger Corp., He will discuss evolution of high tensile weld metal with low hydrogen electrodes.

Several papers will discuss design and fabrication of nuclear reactors, recently developed procedures and techniques, and effects of neutron radiation on weldability and mechanical properties of structural metals.

Sessions will also cover latest developments in: welding titanium and zirconium; brazing stainless steels and high-temperature alloys; filler metals for welding high-strength steels; precision welding control; advances in welding research.

Special feature will be sessions sponsored by the Committee on Electric Welding of American Institute of Electrical Engineers. Two sessions will treat resistance welding; a third will cover arc welding.

All technical sessions will be held at the Hotel Sheraton, AWS headquarters for this meeting. The Welding Show, featuring exhibits and demonstrations of latest equipment, filler metals, supplies, will be at Convention Hall.

Oxygen increase for Airco plant

Effective January 1, the Butler, Pa., air separation plant of Air Reduction Sales Co., New York City, doubled its capacity. The plant produces liquid and gaseous oxygen, nitrogen and argon.

Norton opens new furnace plant

Norton Co. recently dedicated its new electric furnace plant at Huntsville, Ala., with ceremonies commencing a two-day open house. Products will include boron carbide, fused zirconia, fused magnesium oxide, fused alumina. Facilities for making aluminum oxide and silicon carbide may be added later. Edward D. Porter is manager.

Tempilstik° FOR ALL HEAT-DEPENDENT OPERATIONS

looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Available in these Temperatures (F.)

113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
275	650	1650
288	700	1700
300	750	1750
313	800	1800
325	850	1850
338	900	1900
350	950	1950
363		2000

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F.

TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures — plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM . . . WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS . . . STATE TEMPERATURES OF INTEREST—PLEASE!

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86% of your welding costs are in labor and overhead...

P&H

welding positioners can slice that in half!

The greatest savings you can realize in your welding operation lie in how you *handle* your weldments.

Are your operators waiting for cranes . . . rolling heavy weldments laboriously by hand . . . welding in awkward, tiring positions that affect both operator efficiency *and* weld quality? These are the factors that send labor and overhead costs skyrocketing. These are the factors that account for 86¢ out of each welding dollar, however, we'll show you how the use of P&H Welding Positioners frequently cut this cost *in half*.

Interested? Of course you are. Write for the facts. Address: W. R. Stephens, Sales Manager, Dept. 303-B Welding Division, Harnischfeger Corp., Milwaukee 46, Wis.

Photo courtesy Lakeside Bridge & Steel Co., Milwaukee, Wisconsin.

All standard P&H welding positioners give full elevation even under capacity load, 360° rotation, 135° tilt.

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SAVE COSTLY REPLACEMENTS

...get fast, strong repairs with Bridgeport No. 192 Low-Fuming Bronze Rod

This scale was a vital link in a plant's materials weighing section. Operations slowed down when its cast iron frame was smashed. Braze welding with Bridgeport No.192 Low-Fuming Bronze Rod had it back on the job good as new in a matter of hours... another example of time and money saved through repair with braze welding.

Bridgeport No. 192 is a low-fuming manganese-type, all-purpose rod recommended for both repair and production welding. It tins readily and the base metal needs relatively little local preheating, thus avoiding brittleness. Many repairs are possible without disassembling or moving heavy equipment. And welds are frequently stronger than the base metal.

Write today for your free copy of Bridgeport's new booklet, "Bronze Welding Alloys."

HANDY GUIDE TO BRIDGEPORT WELDING ALLOYS		
ALLOY	Welding Method	Approx. Melting Point °F
192 Low Fuming Manganese	GAS	1600
191 Manganese Bronze (Navy)	GAS	1600
196 Bridgeport Bronze	GAS	1600
606 Silicon Bronze (3% Si)	GAS or ARC	1865
548 Nickel Silver	GAS	1675

Bridgeport BRASS CO.

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RWMA elects new president

The Resistance Welder Manufacturers' Association recently elected David V. Uihlein as president of the Association. Mr. Uihlein is president of Banner Welder, Inc., Milwaukee. William H. Carrigan, vice-president and general manager of Kirkhof Mfg. Corp., Grand Rapids, was elected to the vice-presidency.

M&T builds new Virginia plant

Metal & Thermit Corp., New York City, has begun construction of its new plant near Montpelier, Va. Expected to begin operation by late 1957, the plant will produce titanium ore with capacity of 10,000 tons per year of rutile and ilmenite. Rutile is used in electrode coatings and ilmenite as pigment in plastic, paints, rubber.

AWS awards for welded design

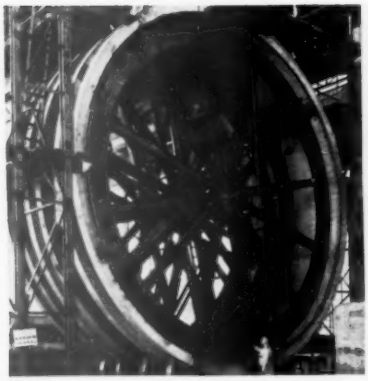
Two new awards for outstanding accomplishments in welded designs have been announced by American Welding Society. Established by Mr. A. F. Davis, vice-president and secretary of The Lincoln Electric Co., Cleveland, they will be known as The A. F. Davis Silver Medal Awards.

Silver medal and certificate will be awarded annually to each author of the paper selected by AWS as best contribution to progress of welding in field of structural design. Similar presentation will go to each author of best paper in machine design. Initial award period will cover 1957 calendar year. Awards will be presented at AWS annual meeting. Paper must be written by one or two authors and published in *The Welding Journal.*

Establish lithium research institute

The American Lithium Institute, Inc., has been established by Foote Mineral Co., American Potash & Chemical Corp., and Lithium Corp. of America, for research into lithium and its compounds. The institute will act as agency for correlation and dissemination of technical information on lithium. Headquarters will be in Princeton, N. J., where a technical library and literature service will also be maintained.

The institute will support an extensive program of research and development on problems involving lithium use in metallurgy, nucleonics, ceramics, chemistry. Marshall Sittig, formerly of Ethyl Corp., has been elected president and managing director.



Building a huge atomic sub

Huge wheel-like midship hull section for one of the largest submarines ever built, the *Triton*, towers above workman as giant submersible takes shape at General Dynamics Corp.'s shipyard at Groton, Conn. Powered by twin nuclear reactors, mammoth underseas craft will have displacement of 5,450 tons compared to 3,000 ton *Nautilus*, world's first nuclear sub.

The *Triton* will provide radar information to Navy task forces. Spokes causing wheel effect are temporary supports. Submerged arc welding was used in fabricating circular hull sections. Power-driven turning rolls are at bottom. (*See "One of welding's most important jobs,"* WELDING ENGINEER, *Nov., 1956, p. 57.*)

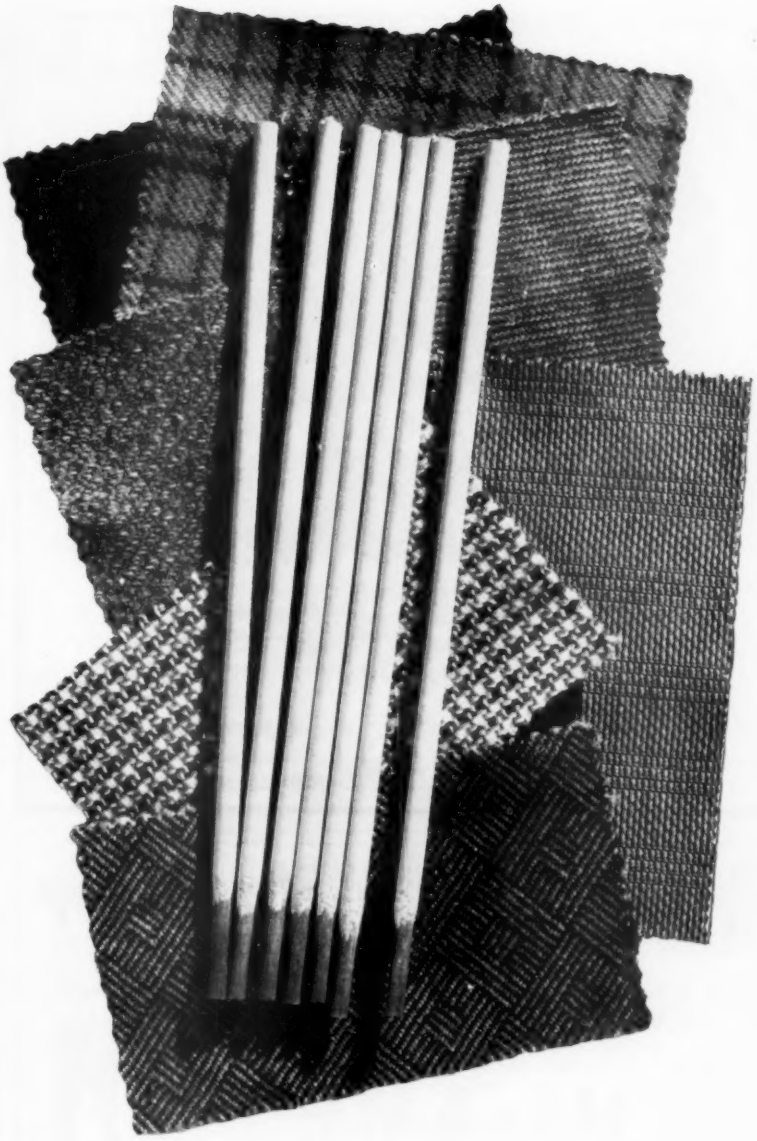
Approve abrasive wheel safety code

The revised edition of the 1947 safety code for The Use, Care, and Protection of Abrasive Wheels has been approved by the American Standards Association. The revision was made under sponsorship of Grinding Wheel Institute and International Association of Governmental Labor Officials.

Some of the major changes are: new size of 8½ by 11 in., two-column arrangement, with code regulation materials on the left, explanatory information on the right. In addition information has been included for the first time on revolving cup guard for portable grinding machines. Steps to take after accidental wheel breakage have also been added.

ASTM to meet in Philadelphia

American Society for Testing Materials will meet for its annual Committee Week and Spring Meeting, Feb. 4-8, at Benjamin Franklin Hotel, Philadelphia. More than 1,400 members and visitors are expected to attend.



Rod performance is **IN THE COATING**

COATING FORMULATIONS are the key to electrode performance. When RUFLUX* is used in the coating, it provides several important advantages. The particular advantages depend upon which RUFLUX* products are used.

Manufacturers look to TAM for three types. They are the highest quality Rutiles, Titanates and Zirconium compounds. A TAM sales engineer can give you the facts on any one quickly and accurately while a request to our NYC office will bring you detailed literature.

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at no extra cost

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STUD WELDING

. . . the fastest electric arc welding process for end welding fasteners

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MERCHANTVILLE 38, N.J.

Here's Just 3 Reasons Why So Many Welders Have Switched

- Wrap around Glass Fibre Tip Insulation—30% *more* heat resistance than any other make!
- Brilliant Red Tips and Trigger—Bright Yellow Handle —all Glass Fibre, an outstanding safety feature!
- Body completely insulated—no bare spots!

HI-AMP®

ELECTRODE HOLDERS

are the most economical to buy and maintain too!

Just ask any Welding Supply Dealer anywhere for PROOF of the above statements.

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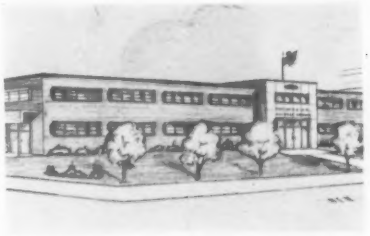
Weld with HI-AMP



MODERN central service building shown in architect's sketch will consolidate engineering department and various crafts.

Norton to build new plant

Construction of a new two-story central service building has begun at Norton Co.'s Worcester, Mass., plant. The modern 3½ acre factory and office building will centralize under one roof the plant's engineering department and a variety of crafts which service the entire plant. The new structure is planned for completion in 1958.

The office will be of brick construction. The factory will be of brick up to window level, aluminum-sheathed cellular insulating panel as siding above. Ground floor will be supported by concrete piles rather than by gravel fill as area of construction is filled land.

Lincoln sponsors machine design

Entrants in new welded machine design competition, sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland, will have a chance to win one of 26 awards, totaling $25,000. Awards will be made for best papers describing design of welding machines and equipment used in construction, mining, certain processing industries and for jigs, fixtures and tooling in all types of industries.

Machinery or equipment to be described may be either a redesign or a new design previously made with or without the use of arc welding. The design must be one in which improvement is made through arc welded steel fabrication.

Residents of the United States or its possessions may compete. Top award is $5,000. A booklet of rules may be received upon application to the Foundation, Cleveland 17.

Notley Co. is new representative

C. G. Notley & Co. Inc., Charlotte, N. Car., has been appointed southeastern states representative for Mid-States Welder Mfg. Co., Chicago. C. G. Notley is president.

Expect peak year for zinc industry

The zinc industry expects 1957 to be a peak year. According to John L. Kimberley, executive vice-president of American Zinc Institute Inc., slab zinc consumption in 1957 may exceed the record 1,078,968 tons of 1955. Outlook for galvanized steel production is in excess of 5½ million tons. Total domestic slab zinc consumption for 1956 was 993,000 tons.

205 at NWSA Dallas meeting

Held Dec. 6 and 7 at the Hotel Statler Hilton, Dallas, the Southwestern Zone Meeting of the National Welding Supply Association, attracted 205 distributors and manufacturers. Vice-president Roy Steward, Hill Equipment & Supply Co., presided at the three business sessions.

Features of the Dec. 6 meeting were a talk by President Stilwell and addresses by R. G. Harrison, Welders Supply Co.; Roy W. Poe, Tweco Products Co.; Albert F. Doussan, Doussan Tool & Supply; Jack McWhorter, Southwestern Welding Supply, and Rip Nichols, Texas Delivery Service, led a panel discussion on transportation.

The Dec. 7 session featured a talk by Ollie A. Lower on prevention of thievery; Paul Haygood, Louisiana Welding Supply Co., spoke on single proprietorship vs. partnership vs. corporation; Ben J. Kerr, Jr., Mercantile National Bank of Dallas spoke on fringe benefits.

Weldor despite loss

LEARNING to weld, despite loss of his right arm, Kenneth James of Schenectady, N. Y., manipulates welding torch as if he had suffered no loss. Mr. James is one of many handicapped persons being instructed in welding at the Modern Welding & Training School in Schenectady under the auspices of the New York State Department of Rehabilitation. Jacob Schaad, manager and instructor, reports many to be proficient.

The product behind the most revolutionary welding rod development in recent years.

Foote
RZ-40
IRON POWDER

The unprecedented acceptance and use of iron powder welding electrodes stems from higher deposition rates, good slag removal characteristics and welding ease. Foote RZ-40 Iron Powder is the predominant coating ingredient in most of these welding rods.

Noted for its high purity, Foote RZ-40 Iron Powder is an atomized material. This assures more uniform physical and chemical properties which facilitate the manufacture and use of welding electrodes.

FOOTE RZ-40 IRON POWDER

Chemical Analysis

	Min.-Max. Range	Typical
Total Fe	97% Min.	98.23%
Metallic Fe	94% Min.	96.21%
Loss in Hydrogen	2.0% Max.	1.25%
C	.08% Max.	.06%
S	.025% Max.	.02%
P	.02% Max.	.015%

Screen Analysis

30 x 200 mesh: 100% thru 30 mesh
98% min. thru 40 mesh
45% approx. thru 100 mesh
25% max. thru 200 mesh

Foote RZ-40 Iron Powder is just one of 27 specialized chemicals, minerals and ferroalloys produced by Foote—the leading supplier of welding rod coating materials for more than three decades.

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Every requirement for faster, better positioned welding—constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt, and rotating bearings, choice of two base styles, and many other features—are built into C-F Positioners.

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C-F positioned welds mean better, more economical welds

Cobalt proposed as X-ray source

The possibility of using radioactive cobalt as a source for X-rays has been advanced by three scientists writing in a recent issue of *Science*, the journal for the Association for the Advancement of Science.

The radiation produced would be equivalent to a ton of radium. The proportion would be approximately 200 pounds of cobalt to one ton of radium. The cobalt would be rendered radioactive by neutrons generated by an atomic pile. The cobalt would be a source of X-rays second in intensity only to an atomic pile, stated the scientists.

The radiation of the cobalt would be 1,000,000 curies. According to the scientists, Dr. Bernard Manowitz and Dr. D. J. Metz, of Brookhaven National Laboratory, L. I., and Dr. R. H. Bretton, Yale University, the cost of producing such a source would be $250,000. However, it would be much cheaper than any present other method for producing such an amount of radiation.

New RWMA technical bulletins available

The following reprints are now available in bulletin form from the Resistance Welder Manufacturers' Association, 1900 Arch St., Philadelphia 3, for a nominal fee: Bulletin 22, "Spot welding of magnesium with three-phase low frequency equipment"; Bulletin 23, "Seam welding low-carbon steel" and "Seam welding dissimilar thicknesses of low-carbon steel." Also available is the first volume of the *Resistance Welding Manual*.

Soldering

FILLING blow hole in aluminum casting. Ultrasonic soldering iron provides efficient means of soldering aluminum, according to Acoustica Associates, Inc., Glenwood Landing, L.I., N.Y. Ultrasonic power is applied to metal surface through molten solder. Cavitation effects in solder remove oxide film and tinning occurs. Oxide dross appearing on solder surface is easily removed by wiping. No flux is required.

Feminine sculptor welds creations

Welding and art seem to go together, at least for Ruth Vodicka, New York City sculptor. Many of her pieces, created by the weldor's torch, have won awards. Materials used include brass, bronze, copper, steel. In addition to the torch, tools include hammer, file, pliers, wire brush for finishing. Ruth began her career as a secretary but has found art infinitely more satisfying.

ASCE creates pipeline division

The American Society of Civil Engineers has formed a pipeline division. The division will act to advance and correlate scientific knowledge and promote and coordinate economic development and construction of engineering projects in the pipeline field.

New members for NWSA

Following have applied for membership in National Welding Supply Association: Du Puy Oxygen & Supply Co., Waco, Texas; Industrial Welding Supply Co., Ponca City, Okla.; Lund Oxygen Co., Inc., Shreveport, La.; McGinnis Welding Supply, Wichita Falls, Texas; National Welding Supply Co., Fort Worth, Texas; T & T Welding Supply, Inc., Big Spring Texas; Worth Welders Supply Co., Fort Worth, Texas.

Brazing question

LYNN Dollar, who operates the IBM sorting machine on the "$64,000 Question" television show, recently visited the Selas Corp. of America, Dresher, Pa. Here in the research laboratory, Miss Dollar is shown an experimental gas-fired arrangement for brazing copper return bends on an aluminum-finned air conditioner core by James B. Henwood, administrative supervisor.

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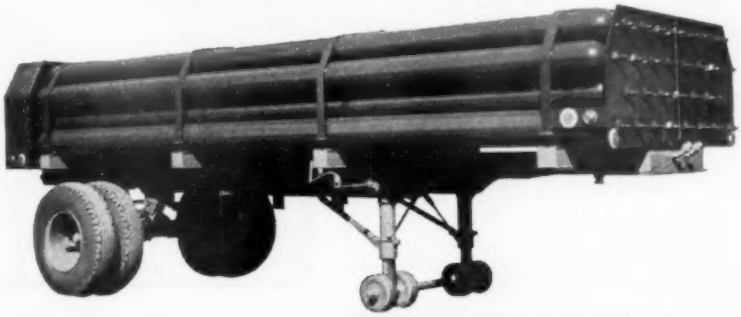

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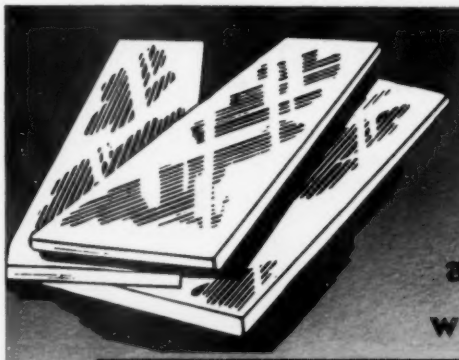

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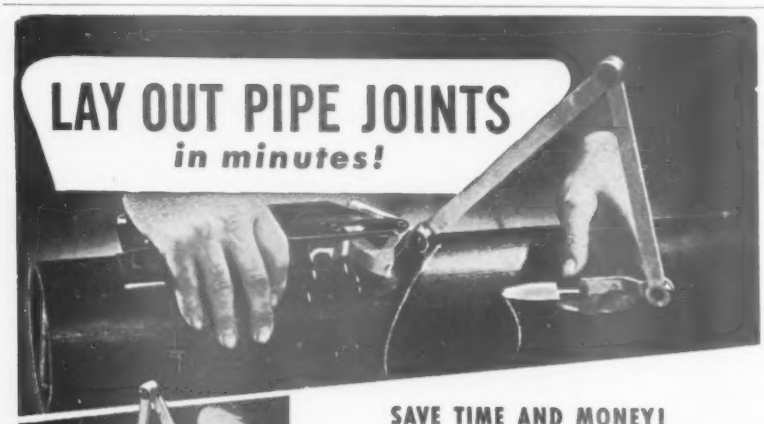

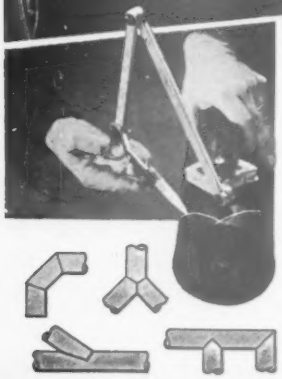

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COMING EVENTS

FEB. 24-28: Annual meeting, American Institute of Mining, Metallurgical & Petroleum Engineers, New Orleans.

MARCH 11-15: Atomic Exposition & Nuclear Congress, Convention Hall, Philadelphia.

MARCH 11-15: Thirteenth Annual Conference & Exhibition, National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

MARCH 25-27: Silver Anniversary technical meeting, annual convention, American Society of Tool Engineers, Shamrock Hilton Hotel, Houston.

MARCH 25-29: Tenth Western Metal Congress & Exposition, American Society for Metals, Los Angeles. Congress at Ambassador Hotel; exposition in Pan-Pacific Auditorium.

APRIL 1-3: Fifty-seventh Annual Convention, International Acetylene Association, Hotel Nicollet, Minneapolis.

APRIL 8-12: Fifth Spring and Thirty-eighth Annual Meeting, American Welding Society, Hotel Sheraton, Philadelphia.

APRIL 9-11: Fifth Annual Welding Show, American Welding Society, Convention Hall, Philadelphia.

APRIL 29-MAY 3: Seventh National Materials Handling Exposition, Convention Hall, Philadelphia.

MAY 13-16: Thirteenth Annual Convention, National Welding Supply Association, Hotel Mayflower, Washington, D. C.

MAY 20-23: Design Engineering Show, Coliseum, New York City.

JUNE 11-13: Third Western Plant Maintenance & Engineering Show, Civic Auditorium, San Francisco.

OCT. 27-NOV. 1: Fourth Annual conference, Atomic Industrial Forum, Second Fall meeting, American Nuclear Society, and Trade Fair of Atomic Industry, Coliseum, New York City.

NOV. 4-8: Thirty-ninth National Metal Exposition & Congress, concurrently with Second World Metallurgical Congress, American Society for Metals, International Amphitheatre, Chicago.

ASCE to meet in Jackson, Miss.

The program of the national convention in Jackson, Miss., Feb. 18-21, of the American Society of Civil Engineers will emphasize pipelines and structural design. It will be the first time the new Pipeline division will have a program.

NWSA sets 1958-59 convention dates

Following are convention dates for 1958 and 1959 of National Welding Supply Association: May 5-8, 1958, at The Americana, Miami Beach, Fla.; May 4-7, 1959, at Hotel Fairmont, San Francisco.

New cladding for aluminum extrusions

Wider usage of aluminum impact extrusions is expected through thin surface cladding, according to Aluminum Co. of America, Pittsburgh. The surface cladding provides cathodic corrosion protection, facilitates finishing, makes joining easier. It is also possible to clad high-strength parts with an alternate aluminum alloy.

A thin layer of brazing alloy, on either inside or outside of impact extrusion, opens new avenues in assembly and joining of electronic components, appliance parts. The new technique employs Alcoa's process of bonding a thin layer of aluminum alloy to sheet or plate. When clad by this method, Alcoa has found extruded parts are protected by the coating even when slight surface imperfections exist—a desirable feature in parts exposed to corrosive elements.

AWS conference for central states

The first annual Central States Welding conference, sponsored by the Cincinnati Section of American Welding Society, will be held Feb. 28-March 1, at the Sheraton-Gibson Hotel, Cincinnati. More than 400 AWS members are expected to attend.

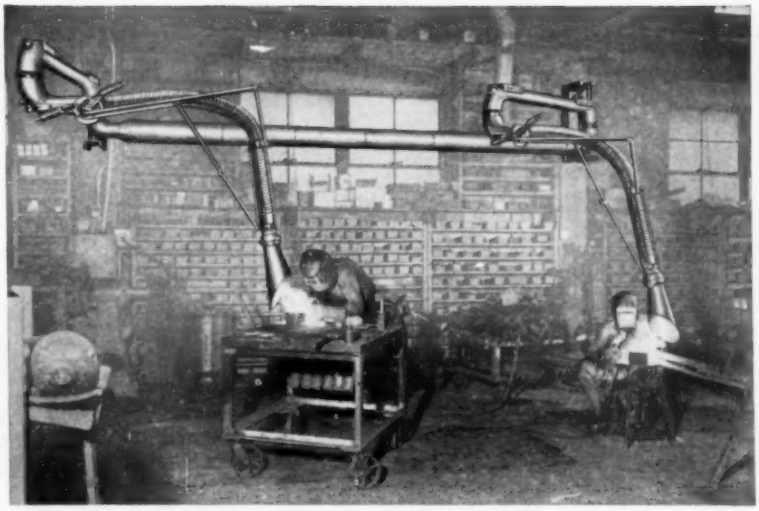
The conference program will include more than 25 exhibit booths of latest welding equipment and processes. Speakers will include J. J. Chyle on an introduction to welding; R. B. McCauley on fundamental physics and metallurgy of welding; R. C. McMasters on weldability and evaluation; D. C. Martin on joining processes; W. L. Green on engineering requirements; A. N. Krugler on manufacturing requirements; Van Rensselaer P. Saxe on design and application; E. E. Wiesmantle on ultrasonic welding; E. J. Funk on Magnaflash welding. Final event will be a panel discussion.

Distributor appointments

Ampco Metal, Inc., Milwaukee: Saginaw Welding Supply Co., Saginaw, Mich.; Central Rubber & Supply Co., Inc., Indianapolis, Ind.

Electro Refractories & Abrasives Corp., Buffalo, N. Y.; Enos & Sanderson Co., Buffalo, N. Y.

United Specialties, Inc., El Dorado, Ark.: Industrial Welding Supply, Pensacola, Fla.; Callaway Brothers Supply Co., Panama City, Fla.; Delta Oxygen Co., Inc., Memphis, Tenn., Paducah, Ky.



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- Old and new type designations, including melt and flow temperatures and plastic range
- Composition of aluminum alloys
- Government specifications and aluminum types that meet them
- Where and how to use the different aluminum types
- Solders for aluminum to aluminum and aluminum to dissimilar metals . . . melt and flow temperatures, plastic range, strength, available forms and applicability to various production processes

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Joseph F. Quaas has been appointed vice-president in charge of manufacturing and production for Eutectic Welding Alloys Corp., Flushing, N. Y. He has served on various committees of the American Welding Society. *Charles Liechti* was named chief engineer, technical services.

John R. Duffy has been appointed chief engineer, by Lindberg Engineering Co., Chicago. *Donald R. Grandy* has been appointed engineering and technical consultant for the Cleveland division office. *Earl G. Olsen* has been named manager of the Rochester, N. Y., sales office.

H. O. Hill, a past president of American Welding Society, retired January 1 from Bethlehem Steel Co., Bethlehem, Pa. He was most recently assistant chief engineer of the fabricated steel construction division. A native of Canada, he began his career with Riter-Conley Co. of Leetsdale, Pa. He has served on many committees of the AWS, in addition to the presidency.

Dr. Clarence Zener has been appointed director of Westinghouse Research Laboratories.

Roy M. Houck has been appointed district manager for the western district (California) by Adamas Carbide Corp., Kenilworth, N. J. *Robert H. Gessner* of R. H. Gessner Co. has been named western New York sales representative. He will operate from his Buffalo, N. Y., office.

Robert E. Buckholdt has been named manager of engineering by Selas Corp. of America, Dresher, Pa. He has been associated most recently with Kendall Contracting Inc., Alliance, Ohio. He will be responsible for furnace and oven designs and engineering applications in the heat-treating field.

Brown

Spoor

Air Reduction Sales Co., New York City, has appointed three regional vice-presidents to administer field activities of production, distribution and sales. *A. C. Brown, Jr.*, general sales manager, was named vice-president, eastern region with offices in New York City; *D. D. Spoor*, equipment sales manager, New York, has been appointed vice-president, midwestern region, will be located in Chicago; *J. J. Lincoln, Jr.*, vice-president, New York, will become vice-president, southern region, with headquarters in Houston.

Lincoln

The following vice-presidents were elected by the board of directors of Carborundum Co., Niagara Falls, N. Y.: *Niles C. Bartholomew, Gene DeMambro, I. Wendell Hamm, Joseph S. Imirie, Leslie E. Simon.*

James W. Richards has joined the sales staff of O.K.I. Welding Supply Co., Cincinnati. He will act as a specialist on sales and service of gas welding and cutting equipment. He was formerly owner of Richard Bros. Supply Co., Youngstown.

Thomas Dunsheath has been named technical director of automatic control system section, Cook Research Laboratories, division of Cook Electric Co., Chicago. He was associated with Magnaflux Corp., Chicago. He is the author of many articles, including "Magnetic particle inspection of welded pipe and tubing," WELDING ENGINEER, pp. 38-42, February, 1951.

O. E. Rogers has been named metallurgist by Victor Equipment Co., Alloy Rod & Metal Division, Norwalk, Calif. He most previously was chief metallurgist for Stoody Co., Whittier, Calif. He is a member of the American Welding Society and American Society for Metals.

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OF PIPE CUTTING AND BEVELING MACHINES OFFERING

A *COMPLETE RANGE* of 1½" to 36" in *DIAMETER!*

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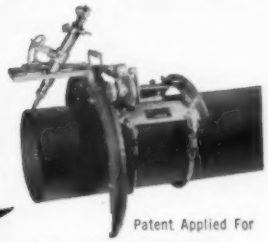

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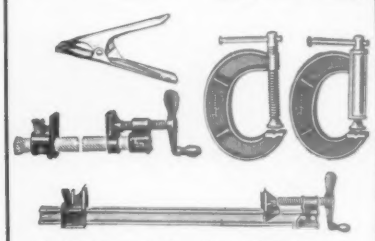

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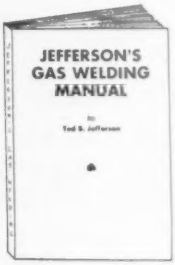

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Dr. William Rostoker has been named assistant manager of metals research department, Armour Research Foundation of Illinois Institute of Technology, Chicago. He will be in charge of applied metallurgy, foundry and steelmaking, physical metallurgy, and welding sections. He joined the foundation in 1951. He is the author of many professional papers. His major work at ARF has been with constitution and transformation of alloys.

The following appointments have been made in the sales department of Alloy Metal Wire Division, H. K. Porter Co., Inc., Prospect Park, Pa.: *W. J. Luster* has been named district sales manager of the New Jersey territory with offices in East Orange, N. J.; *E. F. Hirsch* was named district manager of the New York City Area, which also includes Connecticut. *Douglas C. Dean* will assist Mr. Hirsch. Both will headquarter in East Orange, N. J. *W. E. Sweeney*, district sales manager for the Riverside Metal Division, will also handle sales in New York and northern Pennsylvania, with headquarters at Rochester, N. Y. *John L. Hoffman* has joined the sales department of Alloy Metal.

G. H. Rearick, Milwaukee plant manager of The Babcock & Wilcox Co.'s Tubular Products Division, has been named to the staff of *W. J. Thomas*, company vice-president. He will assist Mr. Thomas on special assignments. *Norman E. Wenzel*, assistant plant manager, will succeed Mr. Rearick as Milwaukee plant manager.

Leo J. Rickes, Jr., has been appointed advertising and sales promotion manager by Adamas Carbide Corp., Kenilworth, N. J. He will headquarter in Kenilworth.

Robert C. Bertossa, formerly head of the metallurgical research laboratory of Chicago Bridge & Iron Co., Birmingham, Ala., has joined the metallurgy department of Stanford Research Institute, Menlo Park, Calif. Mr. Bertossa has specialized in the field of vacuum brazing and has done a great deal of work on high temperature brazing.

Died . . .

Fred B. Loucks, 60, president and founder of Advance Welding & Engineering Co., Milwaukee, died in that city January 8 of a heart attack. Founding Advance Welding in 1940, Mr. Loucks was previously employed by Oxweld Railroad Service, Linde Air Products, Air Reduction Sales Co., National Cylinder Gas Co. He is survived by his widow Edith.

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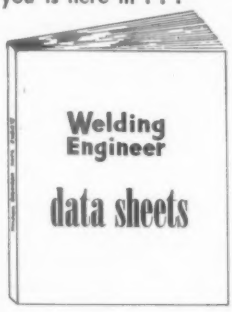

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Welding **Platens**

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FOR SALE—10 lb. CO_2 cylinders, brand new. Can also be used for oxygen, etc. ICC 3AA 2015, manufacturers date 10/53, made of Cromoly Steel, flat bottoms. Size 17" high—6¾" dia., Weight 19 lbs. empty. Price $8.00 each, FOB Phila.

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WELDING **PLATENS**

STAHL EQUIPMENT CO.
94 Washington St. Brookline 46, Mass.

HELP WANTED

DISTRIBUTOR of new Precision Flame Cutting Machine requires experienced man to head up nationwide sales and service. **Reply Box No. 214, Welding Engineer, 12 E. Grand Ave., Chicago 11, Ill.**

HELP WANTED

REPLIES (Box No.): Address to office at 12 E. Grand Ave., Chicago 11, Ill.

ATTENTION—ENGINEERS & DESIGNERS WITH IMAGINATION

WORTHINGTON

. . . is seeking to fill key positions in the formation of a new design section for the development of manipulation equipment and fixtures for the welding industry.

Career opportunities for . . .
Machine Designers • Welding Engineers • Stress Analysts

. . . with experience in the design and application of machine tools and fixtures, and/or, positioning and fixturing for automatic welding procedures.

If you have a background in any of these fields, and have faith in the continued growth of the welding industry, here is a ground floor opportunity. Liberal Company benefits, congenial working atmosphere, near pleasant suburban Northern New Jersey Communities. Please send complete resume of background including salary requirements to:

K. W. Horsman, Gen'l Mgr., Worthington Corp.
Plainfield Div., Plainfield, N.J.

WELDING ENGINEER

MANUFACTURING RESEARCH & PROCESSES DEPARTMENT

Welding section of Manufacturing Research & Processes Department has excellent opportunity for a recent or experienced graduate engineer or a man with equivalent training who has experience in welding. The applicant selected will assist in research, development and production of welding processes and also act as consultant to other sections. Experience in aircraft manufacturing preferred. Must possess ability to work with high degree of independence. Salary commensurate with experience.

Please send complete resume to
MR. CHARLES J. KETSON, Employment Manager

REPUBLIC AVIATION
FARMINGDALE, LONG ISLAND, NEW YORK

free literature . . . . . USE CARD ON PAGE 113

51. ARC WELDERS—National Electric Welding Machines Co. Complete data on eight automatically operated arc welders for variety of applications, with illustrations, in *New Welding News* (Vol. 10, No. 4).

52. STEEL MILL—Air Reduction Sales Co. Entitled "Welding and cutting in steel mill maintenance." 6-page reprint (form ADR 109) deals with steel mill mechanical maintenance.

53. HOLDERS, CLAMPS—Lenco, Inc. Illustrated folder (form 1056) describes electrode holders, ground clamps.

54. HEAT TREATING—Armor-Tuf Sales Corp. Heat treating with "Armor-Tuf" steel hardening compound is treated in 4-page brochure.

55. RW TRANSFORMER—The Taylor-Winfield Corp. Sheet 9-012 treats welding-press transformer; sheet 5-780 treats "T-W" boosters.

56. GRINDING WHEEL—Minnesota Mining & Mfg. Co. 12-page illustrated booklet "Modern Metal Finishing with 3M PG Wheels" describes "PG" (polishing and grinding) wheel applications.

57. STEEL WIRE—Pittsburgh Steel Co. Illustrated 120-page wire handbook features 100 types of steel wire, including welding wire.

58. SOLDERING—Tweco Products, Inc. Bulletin A-100 contains photographic step-by-step instructions for soldering aluminum welding cable to copper terminals, and arc welding accessories.

59. MONEL ELECTRODE—The McKay Co. Technical bulletin treats new all-purpose Monel arc welding electrode.

60. POSITIONER — Worthington Corp. Model "5P" welding positioner for automatic, manual welding is subject of bulletin R-1700-S18 P.

61. WORK LIFT—Tilt-O-Lift Co. Illustrated sheet describes Model "H-1" work lift for lifting and positioning.

62. HOSE REEL—United Specialties, Inc. Illustrated sheet (form A-1) discusses "Weldreel" new single hose reel.

63. THREADED LEVELER—The Ohio Nut & Bolt Co. Bulletin 564 illustrates and describes three types threaded levelers.

64. ABRASIVE SAFETY—Grinding Wheel Institute. Revised edition of 1947 safety code, "The Use, Care, and protection of abrasive wheels," discusses safe speeds, etc. Approved by American Standards Association.

65. WELDING CABLE—General Cable Corp. Illustrated 6-page folder covers copper, aluminum welding cables, welder power supply cables.

66. RW ELECTRODES—Ampco Metal, Inc. Complete line of "Ampco-Weld" resistance welding electrodes, accessories, is subject of bulletin RW-10.

67. CABLE CONNECTOR—Jackson Products. Illustrated sheet (form 20-S) describes new "Quik-Trik" cable connectors with Neoprene rubber insulators, easy to connect and disconnect.

68. ALUMINUM CHART—All-State Welding Alloys Co., Inc. Chart is for converting old aluminum type designations to new. Provides selection chart for alloys, fluxes.

69. CUTTING TORCH—Arcair Co. 2-color, 4-page folder discusses "Arcair" torch for cutting, gouging, beveling, grooving. Also available is pocket-size booklet of case histories.

70. RECTIFIER—Allis-Chalmers Mfg. Co. Bulletin 12B8494 treats mercury arc rectifiers. Illustrated.

71. REGULATORS — York Engineering Co. 4-page illustrated folder discusses pressure regulators for welding, cutting.

72. ABRASIVE BOOK — Ravbestos-Manhattan, Inc. 36-page book (6465) contains data on rubber, resinoid bonded grinding wheels—sizes, shapes, types of grain.

73. FLUXLESS BRAZING—Aeroprojects Inc. 4-page leaflet SBR-6A describes "Sonobraze" ultrasonic equipment for fluxless brazing.

74. TEMPERATURE—Tempil Corp. Booklet explains how temperatures are measured.

75. METAL CLEANING—Oakite Products, Inc. Booklet "Some good things to know about metal cleaning," gives many helpful ideas. 44 pages.

76. PRESS WELDER—The Taylor-Winfield Corp. Bulletin 3-513 illustrates discussion of new size 3½ resistance press welder.

77. THREADED STUD — Nelson Stud Welding Div. Illustrated folder describes the "CP" threaded end welding stud.

78. ABRASIVE CUT-OFF—Wallace Supplies Mfg. Co. 44-page book, illustrated, treats abrasive cut-off units, including combination cut-off, deburring saw.

79. SALAMANDERS—Insto-Gas Corp. Illustrated pocket-size booklet treats salamanders, soldering torches, irons, melting pots, cylinders, etc.

80. LIFTING DEVICES—Merrill Bros. Pocket-size book, 19 pages, (3-S-5) discusses lifting clamps, drum tilters, screw clamps.

81. METAL CLEANING—Oakite Products, Inc. Case histories are amply illustrated in "Oakite News service" (Vol XL, Nos. 11-12).

82. HI TEMP PIPE—Tempil Corp. Illustrated reprint is entitled "Metallurgical considerations of main steam piping for high temperature, high pressure service."

83. ELECTRODE—Page Steel & Wire Div. 4-page flyer DH-1218-J is comparison of main types of electrodes, welding wire.

84. GRINDING WHEEL—Bay State Abrasive Products Co. New illustrated 17-page catalog covers reinforced resinoid grinding wheels: raised hub disc, abrasive cut-off, resinoid straight.

85. METAL CUTTING—W. O. Barnes Co., Inc. Handbook of metal sawing, in 36 pages, covers selection, use of various saws.

86. FIRE CHECK—Selas Corp. of America. Bulletin SC-1006 describes operation, construction of automatic fire checks and safety blowouts to prevent combustion in supply lines.

87. HEAT TREATING—Lindberg Industrial Corp. Heat-treating furnaces are subject of 4-page bulletin.

88. POWER TUBES—General Electric Co. 15-page illustrated booklet (ETX-10H) discusses ignitrons, rectifiers, thyratrons.

89. INSULATION COATING — Lovell Chemical Co. Handy pocket-size 4-page booklet describes "No-Short" liquid insulating coating for electrodes, horns, holders, seam welding wheels and arms. Applied by dipping or brushing directly.

90. HARDFACING—Victor Equipment Co. Convenient chart (form 340-CW-4-56) compares hardfacing alloys of various firms.

91. ZIRCONIUM—The Carborundum Metals Co., Inc. 65-page booklet, "Facts about zirconium" presents up-to-date information about this metal.

92. GOGGLES, SHIELDS—Glendale Optical Co., Inc. 16-page catalog discusses, with appropriate illustrations, weldor's and chipper's goggles, chipping and grinding spectacles, face shields, helmets, welding plates and lenses, etc.

93. FLUX, SOLDER—Farrelloy Co. Sheet details various types of soldering fluxes for use on steel, iron, copper, brass, etc. Also listed are acid and dope brushes, soldering paste.

94. ELECTRODE HOLDER—Tweco Products Co. Model "AL-300 Twecotong" lightweight electrode holder (weighs 13½ oz) is subject of illustrated sheet (Form T-300).

95. ROLL PLANISHER—Airline Welding & Engineering. Roll planishing fixture is described on illustrated sheet.

96. WELDORS' TRAINING — National Technical Training Services. Folder supplies basic facts about new correspondence course covering supervision, inspection, design, for weldors.

97. RADIOGRAPHY—Mitchell Radiation Products Corp. Illustrated brochure describes the "X-Tron 180" portable X-ray unit.

98. SS WALLS—American Silver Co., Inc. Source material bibliography covers stainless steel honeycombs, including welding, brazing articles from 1950 on and titles of publications in field.

99. GRINDERS—The Nedco Co. Catalog sheet illustrates description of grinding, sanding, polishing machines for welding use.

100. EXTINGUISHER—The Fyr-Fyter Co. Illustrated folder discusses CO_2 fire extinguishers. The "Silver-Lite 500" instant extinguisher of stainless steel is subject of another folder.

101. DUST COLLECTOR—Wheelabrator Corp. Bulletin 557-D treats super-cleaning atmospheric air by special cloth-filter dust collector.

102. HELMETS, SHIELDS — American Optical Co. Catalog sheet (S-4639) discusses welding helmets, shields, hand-

shields, lift-front holder.

103. SILVER BRAZING—Handy & Harman. 24-page bulletin 20 discusses, with composition and uses, "Easy-Flo" and "Sil-Fos" low temperature silver alloy brazing.

104. INDUCTION HEATING—Inductotherm Corp. Bulletin 70, an 8-page, 2-color brochure covers line of induction heating furnaces and related equipment.

105. CAST IRON—International Nickel Co., Inc. Compact booklet discusses "Ni-Rod" and "Ni-Rod 55" electrodes for welding cast irons.

106. X-RAY UNIT—Holger Andreasen, Inc. Illustrated sheet treats the "Andrex" 130 kvp, 5 ma tube X-ray unit.

107. WELDER CONTROL—Square D Co. Bulletin SM 235 discusses welder control selector with basic components and types.

108. EXHAUSTING—Engwald Corp. Illustrated brochure describes "Weld-O-Vent" welding fume exhausters.

109. TURNING ROLLS—Aronson Machine Co. 6-page catalog section (600, NWSA section 460) concerns turning rolls for welding.

110. GRINDING—Stow Mfg. Co. 8-page catalog 57 discusses multispeed and single speed flexible shaft machines for grinding, polishing.

111. SHAPE CUTTING—Heath Engineering Co. Three sheets—form 21, 23, 24—treat "Ultra-Graph" models of precision flame-cutting machines.

112. HARDFACING—Rankin Mfg. Co. Folder discusses hardfacing rods composition and uses.

113. SOLDERING FLUXES — Accurate Specialties Co., Inc. Bulletin concerns soldering fluxes "910," "310" and "183."

114. HELMETS—Mine Safety Appliance Co. 4-page brochure covers welding helmets, combination helmets, handshields, protective accessories: sleeves, leggings, ear protectors, gloves, aprons.

115. ELECTRODE HOLDER — Jackson Products, Inc. Pocket-size booklet presents data on electrode holders, ground clamps, cable connectors, etc.

116. LOW TEMP BRAZING—Handy & Harman. Latest issue of "Low temperature brazing news" (No. 75) contains case histories, with tips on better brazing. Section on new high temperature alloys and also proper fluxing.

117. HELMET-SAFETY CAP—The Fibre-Metal Products Co. Bulletin 49 treats "Quick-Lok" new compact connect-disconnect attachment for welding helmet-safety cap combinations.

118. WELD ALUMINUM—Eutectic Welding Alloys Corp. "Arc weld aluminum as easily as mild steel" is new two-color folder describing low amp "EutecTrode 2101" d-c electrode for aluminum, with extruded coating.

119. WELDERS—Precision Welder & Flexopress Corp. Bulletin MF-100 describes and illustrates types of magnetic force welders.

120. ARC WELDER—Enterprise Engineering Co. Literature illustrates construction and use of "Jett Uni-Temp" arc welder, portable.

121. GRINDERS—K. O. Lee Co. Catalog sheet discusses "T500" tool post and thread grinders for internal, external precision grinding.

ADVERTISERS IN THIS ISSUE

This advertisers' index is included as a convenience and is in no way part of the advertising contract. Although every care has been taken to index accurately some errors may have occurred and no allowance will be made for them.

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Literature offered in ads

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125. Adjustable Clamp Co.—Catalog on complete line of "Jorgensen" and "Pony" clamps.

126. Airline Welding & Engineering—Information on how to make fusion butt welding a push-button operation.

127. Air Reduction Sales Co.—Data and free sample of "Easyarc 10" all-position 6010 electrode with iron-powder coating.

129. Allen Co., Inc., L. B.—Information on fluxes for soldering, brazing and welding.

130. Allied Welder Corp.—Information on standard and special welders, automation equipment, automatic arc welders, welding guns and creative design.

131. Alloy Rods Co.—Informative data sheets on how savings and quality of "Atom-Arc" electrodes can benefit you.

132. All-State Welding Alloys Co., Inc.—Data for selection of alloys and fluxes to weld, braze and solder aluminum and "Aluminum Chart."

133. American Manganese Steel Div.—Data on "Amsco" "Wear-Sharp" and "Cast-to-Shape" repointers for rebuilding worn out teeth.

134. Ampco Metal, Inc.—Bulletin W-17 on longer life of five grades of "Ampco-Trode" electrodes.

135. Amperex Electronic Corp.—Data sheets and name of nearest distributor of welding ignitrons.

136. Arcos Corp.—Data on how to get longer service from stainless welded equipment with stainless electrodes.

137. Arcos Corp.—Details on how to get results from submerged-arc welding with stainless coiled wire.

138. Aronson Machine Co.—Detailed engineering data on positioners, turning rolls, turntables and magnetic welding clamps.

139. Atlas Welding Accessories, Inc.—Details on 30 models of "Tomahawks" for weld cleaning jobs.

140. Becker Bros. Carbon Co.—Catalog on carbon brushes for all makes of welding equipment gives complete specifications, factory numbers, scaled drawings, etc.

141. Bernard Welding Equipment Co.—Further information on how "Shortstub" electrode holders equipped with "Cable-Splint" helps eliminate cable fraying for modern high-current, high-speed welding.

213. Bridgeport Brass Co.—Booklet, "Bronze Welding Alloys."

142. Columbia Electric Mfg. Co.—Catalog WE-400 on the "Tong Test" a-c/d-c ammeter.

143. Contour Maker Corp.—Information and instruction book on laying out pipe joints.

144. Crescent Co., Inc.—Information on "Dynapower" welding cable.

145. Crucible Steel Co. of America—Data on how special steel warehouse service stocks Rex high-speed steel, all grades of tool steel, stainless steel, hollow drill steel and other purpose steels.

146. Cullen-Friestedt Co.—Low-cost welding "C-F Positioner Catalog."

147. Delta Welder Corp.—Details on how equipment developments and machines are saving time and money for nationally known manufacturers in high production resistance welding.

148. Dockson Corp.—Distributor's name and complete catalog on torches.

149. Drawalloy Corp.—Information on precision-drawn hardfacing and welding wire.

150. Eastman Kodak Co.—Data on new industrial "Type AA" X-ray film.

151. Eisler Engineering Co., Inc.—Information on resistance-welding and general welding equipment.

152. Erico Products, Inc.—Information on "Cadweld" connections and "Caddy" arc welding accessories.

153. Eutectic Welding Alloys Corp.—Details on how warehouse-service centers can bring you free technical information.

154. Eutectic Welding Alloys Corp.—Information on low-temperature welding alloys.

155. Fibre-Metal Products Co.—Details on "Fibre" and "Fiberglas" helmets, helmet attachments, insulated "Eureka" holder, face shields, weld cleaning hammers and "Freshair" system.

156. Foote Mineral Co.—Information on "RZ-40" iron-powder and other chemicals, minerals and ferralloys for welding rod coating materials.

157. General Electric Co.—Details on stable arc and current, flexible control and economical operation of rectifier welders.

158. General Electric Co.—Information on new line of 200, 300 and 400-amp welders.

159. General Electric Co.—Guide, "Power Tubes for Industry and Broadcast" (ETX-10J), on characteristics and warranties for all G-E transmitting and other power tubes.

160. H & M Pipe Beveling Machine Co.—Fully illustrated details on full line of pipe-cutting and beveling machines.

161. Handy & Harman—Bulletin 20 on speed and economy in "Easy-Flo" silver brazing and information about joint design and fast brazing methods.

162. Harnischfeger Corp.—Facts on how economical "P&H" welding positioners can cut welding costs in half.

163. Harnischfeger Corp.—Bulletin R-29, "P&H Smootharc Welding Electrodes," for full description and specification data on iron-powder, low-hydrogen electrodes.

164. Harris Calorific Co.—Information on torches for natural gas and propane, with compressed air.

165. Haynes Stellite Div.—Descriptive literature on complete line of welding rods.

166 Hobart Bros. Co.—Information on a-c/d-c combination, electric motor drive, gas engine drive and d-c rectifier welders.

167. Hobart Bros. Co.—Details on d-c power/a-c welder combination, "Contractor's Special" welders and a-c transformer.

168. Hobart Bros. Co.—Catalog, "Arc Welding Electrodes."

169. Hobart Bros. Co.—Data on automatic arc welding, semiautomatic welding, cutting and gouging, pre-heat and stress relief.

170. Independent Engineering Co., Inc.—Details on how to reduce cylinder handling with gas supply trailers.

171. International Nickel Co., Inc.—Details on how "Inco-Rod A" solves problem welds between dissimilar alloys.

172. International Nickel Co., Inc.—Data on welding electrodes.

173. Invincible Vacuum Cleaner Mfg. Co.—Folder on all types of flux recovery systems.

174. Jackson Products—Details on new "Quik-Trik" cable connectors, ground clamps, splicers and lugs for power losses and accidents along your cable lines.

175. K-G Equipment Co., Inc.—Information on new "Flowmeter Regulator" for industrial gas flow control.

176. KSM Products, Inc.—Data on stud welding for end welding fasteners.

177. Krembs & Co.—Flux chart; also state which sample fluxine you desire.

178. Lenco, Inc.—Information on "Hi-Amp" electrode holders.

179. Lewis Welding & Engineering Corp.—Bulletin 6960 gives details and prices on "Universal" automatic welding head manipulator.

180. Lincoln Electric Co.—Bulletin SB-1351 gives specifications on "Jetweld LH-70" low-hydrogen, iron-power, E-6016 electrode for high-speed welding of hard-to-weld steels.

181. Linde Air Products Co.—Booklet on how "X-7" anti-spatter compound saves time and cuts costs.

(Continued on page 114)

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page.

Also information about

NEW PRODUCTS described on pages 86 to 95

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

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★ For copies of any manufacturers' bulletins described on these pages, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on either post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers and the items that interest you. The New Products section begins on page 86.

WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards, postmarked after the deadline date cannot be processed.

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12 East Grand Avenue
Chicago 11, Ill.

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182. Linde Air Products Co.—Illustrated literature on modern process of powder-cutting.

183. Maitlen & Benson, Inc.—Details on "Wypo" cutting and welding tip cleaners.

184. Manhattan Rubber Div.—Details on "Moldiscs" portable grinding wheels, portable wheels, cut-off wheels and centerless wheels for every cutting or grinding operation.

185. Merrill Bros.—Information on lifting clamps, twin and drum lifters, drum tilter and other material handling devices.

186. Metal & Thermit Corp.—Catalog HS-56 fully describes each electrode and "Selector Chart" simplifies selection of the right "Hardex" electrode for over 200 applications.

187. Metal Thermit Corp.—Information on new, improved "Murex U-13" E-6013 electrode.

188. Miller Electric Mfg. Co., Inc.—Information on series of selenium rectifier type d-c welders.

189. National Carbide Co.—Write for name and address of nearest supplier.

190. National Cylinder Gas Co.—Descriptive literature on "Rego" tools for welding and cutting.

191. National Welding Equipment Co.—Data on cutting torch with "Multiple Mixing." Mixer can be located in torch handle, tubes or head.

192. Norton Co.—Information on reinforced wheels for countless weld grinding jobs.

193. Page Steel & Wire Div.—Folder DH-1277 on gas welding rods.

194. Page Steel & Wire Div.—Folder DH-402A on submerged-arc and inert-gas welding wire.

195. Pure Carbonic Corp.—Information on gas, liquid or solid CO_2 inert gas shield for industrial uses.

196. Rankin Mfg. Co.—Further details on hardfacing electrodes and rods.

197. Ruemelin Mfg. Co.—Bulletin 37-E on fume collectors that eliminate harmful fumes, heat and smoke.

198. Sellstrom Mfg. Co.—Complete information and free literature on new jumbo welding goggles.

199. Shawinigan Products Corp.—Information on carbide.

200. Shoot-A-Lite Corp.—Literature on safety gas lighter for welding and cutting torches.

201. Smith Corp., A. O.—Information on "SW-35" E-6020 mild steel eletcrodes.

214. Smith Welding Equipment Corp.—Full information on "Econoflo" regulators for trouble-free gas flow control.

202. Steel Sales Corp.—Details on how "Silvaloy" silver-brazing alloy preforms aid production brazing.

203. Stoody Co.—Circular contains full description of present semiautomatic wires and typical application.

204. Stulz-Sickles Co.—Detailed specifications on "Manganal" manganese-nickel steel hot rolled plates.

205. Tempil Corp.—Information on, and sample pellets of, temperature indicators.

206. Titanium Alloy Mfg. Div.—Detailed literature on coating formulations with rutiles, titanates and zirconium compounds.

207. Tweco Products, Inc.—Catalog on complete line of arc-welding accessories and "Tweco-Lite" aluminum arc welding cable.

208. United Wire & Supply Corp.—Data on Phoson brazing, Phoson and Sil-Bond with Sil-Flux alloys.

209. Vickers Electric Div.—Information on "Controlarc" d-c welder that gives you remote control of current and type of arc.

210. Victor Equipment Co.—Details on torch for hot, tough jobs that last longer.

211. Victor Equipment Co.—Bulletin 358 on hardfacing with automatic rods.

212. Worthington Corp.—Useful data on line of positioners, automatic welding head manipulators, turning rolls, head and tailstocks.

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Welding Info-Aids,

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WELDING ENGINEER, 12 East Grand Ave., Chicago 11, Ill.

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Imagine a holder weighing half as much as your helmet!

capacity
300 AMPS
ELECTRODES
1/4 - 1/16

TRY

MODEL AL-300

TWECOTONG

it weighs just 13½ ounces

Here is a holder that's made for the man who wants a lightweight holder for easier welding. Its lower body and upper lever are forged aluminum alloy . . . with current carrying capacity equal to the much heavier copper alloys. Like all TWECO electrode holders, TWECOTONG AL-300 has tips and body insulation of SUPER-MEL laminated glass cloth . . . the toughest, safest and longest lasting holder insulation made.

The upper and lower jaws of AL-300 TWECOTONG are quickly and easily replaceable, as are all other parts. The jaws hold the electrode with a vice-like grip so you know where it is at all times; yet they open easily to change rods. You can install this holder on the line in one minute flat. Just bare the cable end, insert it in the reamed hole in the holder body and tighten one cone shaped screw . . . that's all!

SEE YOUR LOCAL WELDING SUPPLY DISTRIBUTOR

Write for FREE Catalog picturing complete line of Arc Welding Accessories and TWECO-LITE Aluminum Arc Welding Cable.

Tweco

MANUFACTURERS OF ELECTRODE HOLDERS • GROUND CLAMPS • CABLE CONNECTIONS FOR ELECTRIC WELDING

BOSTON AT MOSLEY • WICHITA, KANSAS, U.S.A.

"Problem weld between dissimilar alloys . . . Inco-Rod "A" takes it in stride!"

says Rolock's Chief Engineer

Rolock Inc., Fairfield, Conn., builds equipment for high-temperature service. To them, difficult welds between dissimilar alloys are an everyday affair.

The weldor above, for example, is completing fabrication of a furnace retort. The flange is steel. The corrugated section at right is Inconel* nickel-chromium alloy . . . to withstand temperatures up to 2050° F.

Trouble at the joint? None at all, now that Rolock is using Inco-Rod "A"* electrode!

"With previous electrodes," writes George Wardwell, Chief Engineer at Rolock, "considerable reworking was needed to eliminate cracks and fissures in problem welds like this one. Now, with Inco-Rod "A" electrode, our weldors work with assurance that the finished weld will be sound in every respect."

Get sound joints when *you* weld dissimilar alloys. With Inco-Rod "A" electrode, you get strong, ductile welds . . . corrosion-resisting . . . of X-ray quality.

And versatile Inco-Rod "A" electrode produces these quality welds in *many* alloy combinations: among ferritic and austenitic stainless steels . . . low alloy and mild steels . . . high-nickel, and other alloys.

What's more, Inco-Rod "A" . . . the electrode with the green flux coating . . . is easy to use. Operates in all positions. Gives spray-type arc and easy slag removal. And manufacturers, who have found that they needed to preheat to prevent hot cracking or fissuring in the weld metal when using other electrodes, find that with Inco-Rod "A" electrode they can produce strong, ductile welds ***without pre-heat.***

Call on Inco whenever you're faced with a "problem" weld between dissimilar alloys. If the problem's *now*, write our welding specialists today!

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO-ROD "A" electrode is supplied in 14-inch lengths in four diameters, 3/32-, 1/8-, 5/32-, and 3/16-inch (the 3/32-inch is center grip) . . . packed in 5-lb. asphalt-lined containers.

INCO **Welding Products** • electrodes, wires, fluxes